U.S. Department of the Interior
National Park Service

Environmental Assessment/Assessment of Effect, South Waterline Improvements

Petrified Forest National Park
Navajo and Apache Counties, Arizona

Summary

At Petrified Forest National Park, the National Park Service proposes to rehabilitate 13 miles of waterline from the Puerco River to the Rainbow Forest developed area at the south end of the park, replace the water distribution system at Rainbow Forest developed area, install sprinkler systems in major buildings at Rainbow Forest, and replace portions of the water distribution system at Painted Desert Headquarters.

This environmental assessment examines in detail two alternatives: no-action and the National Park Service preferred alternative. The preferred alternative would have no or negligible impacts to soils, wilderness values, water resources, air quality, cultural landscapes, ethnographic resources, visitor experiences, the socioeconomic environment, prime and unique farmlands, and environmental justice.

There would be short-term, minor, adverse impacts to biotic communities, and long-term, negligible to minor, adverse impacts to petrified wood and other fossils. Impacts to archaeological resources would be mixed—ground-disturbing activities would have short-term, negligible to minor, adverse impacts, but fewer waterline breaks, better leak detection, and faster repairs would have long-term, minor to moderate benefits to archaeological resources.

New fire suppression systems at Rainbow Forest would have long-term, minor, beneficial impacts on historic structures and on museum collections. Reduced risk of water contamination and construction accidents, plus improved fire safety at Rainbow Forest would result in long-term, minor, beneficial effects on human health and safety. Water service disruptions due to construction would have a short-term, minor, adverse impact on park operations, but water system improvements would have a moderate beneficial impact on operations over the long term once construction is complete.

Notes to Reviewers and Respondents

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. *If you want us to withhold your name and address, you must state this prominently at the beginning of your comment.* We will make all submissions from organizations and businesses, and from individuals identifying themselves as representatives or officials or organizations or businesses, available for public inspection in their entirety.

Please address comments to:
Michele Hellickson, Superintendent
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, AZ 86028

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ACRONYMS AND ABBREVIATIONS

CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
EA	Environmental Assessment
FONSI	Finding of No Significant Impact
gpd	Gallons Per Day
gpm	Gallons Per Minute
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
NTUA	Navajo Tribal Utility Authority
OSHA	Occupational Safety and Health Administration
PVC	Polyvinyl chloride
SHPO	State Historic Preservation Officer
USC	United States Code

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INTRODUCTION

PURPOSE AND NEED FOR ACTION

The National Park Service (NPS) is considering rehabilitating 13 miles of waterline from the Puerco River to the Rainbow Forest developed area at the southern end of Petrified Forest National Park, replacing the water distribution system at Rainbow Forest developed area, installing sprinkler systems in major buildings at Rainbow Forest, and replacing portions of the water distribution system at Painted Desert Headquarters at Petrified Forest National Park. This action is needed to continue to provide a reliable, safe source of water to Rainbow Forest and other areas of the park, enhance fire suppression capabilities to better protect lives and historic structures, and improve operational efficiency.

An environmental assessment (EA) analyzes the proposed action and alternatives and their potential impacts on the environment. This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), regulations of the Council on Environmental Quality (40 CFR 1508.9), and the National Park Service Director's Order – 12, *Conservation Planning, Environmental Impact Analysis, and Decision-making.*

Park Purpose, Significance, and Mission

An essential part of the planning process is understanding the purpose, significance, and mission of the park for which this EA is being prepared.

Park Purpose. Park purpose statements are based on national park legislation, legislative history, and NPS policies. The statements reaffirm the reasons for which the national park was set aside as a unit of the National Park System, and they provide the foundation for national park management and use.

The purpose of Petrified Forest National Park is as follows:

- *Preserve and protect the Petrified Forest, its outstanding paleontologic sites and specimens, its associated ecosystems, cultural and historical resources, and scenic and wilderness values for present and future generations,*
- *Provide opportunities to experience, understand, and enjoy the Petrified Forest and surrounding area in a manner that is compatible with the preservation of park resources and wilderness character,*
- *Facilitate orderly, regulated, and continuing research, and*
- *Promote understanding and stewardship of resources and park values by providing educational opportunities for students, scientific groups, and the public.*

Park Significance. Park significance statements capture the essence of the national park's importance to the natural and cultural heritage of the United States of America. Significance statements do not inventory park resources; rather, they describe the park's distinctiveness and help place the park within the regional, national, and international context. Defining park

significance helps managers make decisions that preserve the resources and values necessary to accomplish the purpose of Petrified Forest National Park.

Petrified Forest National Park is globally significant for its exposures of Chinle Formation fossils that preserve evidence of the Late Triassic Period ecosystem of more than 200 million years ago. The detailed paleontologic (fossil) and stratigraphic (layered) records of the park provide outstanding opportunities to study changes in organisms and their environments in order to better understand today's environment.

Park Mission. Park purpose describes the specific reason the park was established. Park significance describes the distinctive features that make the park different from any other. Together, purpose and significance lead to a concise statement—the mission of the park. Park mission statements describe conditions that exist when the legislative intent for the park is being met.

The expansive, undulating, and colorful Painted Desert reveals layers of history that began over 200 million years ago. Life of the Late Triassic Period, hardened into fossils and petrified wood, offers a globally significant mosaic of an ancient ecosystem, vastly different from today. Figures pecked into boulders, the remains of ancient homes, and well-traveled pathways speak of peoples drawn here for thousands of years. Petrified Forest supports the National Park Service mission through the preservation of awe-inspiring vistas and rare opportunities for visitors and scientists to discover and wonder about the stories this land reveals. Petrified Forest National Park does not stand alone, but is interconnected with the stories of other fossil parks on the Colorado Plateau, and is part of the cumulative expression of our national heritage, represented in the National Park System.

PROJECT BACKGROUND

From the beginning of the monument (Petrified Forest National Park did not become a park until 1962), the management staff faced difficulty securing an adequate water supply to meet the increasing development and visitation demands at Rainbow Forest. A well was dug in 1932 (and deepened in 1934) at Rainbow Forest; however, the well water had a high salt content and was unsuitable for all but sanitary uses. Hauling of potable drinking water into the area continued. In 1934, the national monument received funding and a commitment of a labor force to be supplied by the Civilian Conservation Corps (CCC), to carry out a variety of projects (NPS 2002b). Between 1934 and 1942, the CCC undertook major improvements, including digging the Puerco well and completing a 13-mile water pipeline from Puerco Well #1 House to Rainbow Forest Headquarters ("south waterline"). A second well and pipeline were constructed in the northern portion of the park for the Painted Desert Inn.

From the Rainbow Forest reservoir, which is a covered 200,000 gallon water tank, north approximately 3.5 miles to a high point on Mountain Lion Mesa, the water pipeline is a 2.5-inch diameter asbestos-cement pipe. The remaining portion from the mesa to the Puerco Well #1 House is a 3-inch diameter asbestos-cement pipe. Two 2-inch laterals run from the 3-inch segment to supply water to comfort stations at Agate Bridge and Puerco Pueblo. The entire waterline is gravity-fed from the Painted Desert reservoir in the northern portion of the park.

The waterline road follows the pipeline, except where the road departs from the pipeline to skirt around Mountain Lion Mesa. The pipeline traverses the mesa.

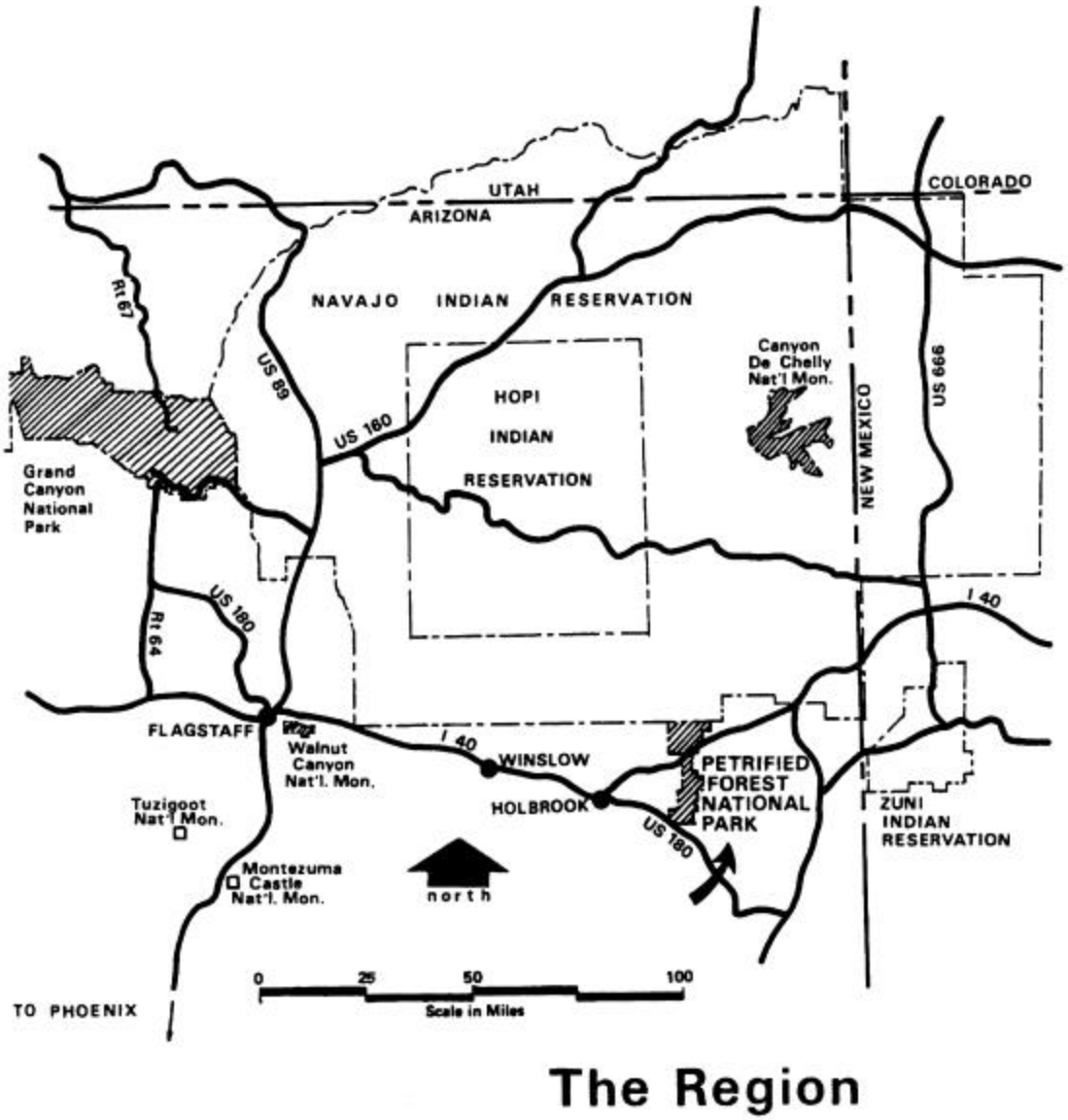
In the 1960s, when the Painted Desert Headquarters Complex was under construction, the pipeline was extended north from Puerco River to the Painted Desert Inn and the new complex. A second well was drilled in 1984 near the water reservoir at Rainbow Forest; however, water from this well was again quite salty. In 1986, the condition of park water pipelines was studied. The resulting report, *Evaluation of Existing Waterlines* (ConCeCo Engineering, Inc. 1986) stated that most of the south waterline was in very good condition and had a life expectancy of an additional 50 years. As a result of the 1986 evaluation, the north water pipeline was replaced in 1991. In May 1997, the park discontinued obtaining water from the Puerco River pumping station, and converted to the purchase of water from the Navajo Tribal Utility Authority (NTUA). The NTUA draws water from wells located several miles east of the park, chlorinates the water, and then pumps it to the park's 500,000-gallon reservoir by Chinde Point. The water is delivered by gravity approximately 20 miles to Rainbow Forest (NPS 2002b).

In 1996, there were seven breaks in the south waterline, and in 1997 there were six. In 1998, approximately 1.25 miles of pipeline north of Mountain Lion Mesa was replaced with polyvinyl chloride (PVC) pipe. Also in 1998, a project request was initiated by park staff to replace the 13-mile south waterline. The construction costs were estimated to be $4,129,544. Funding became available in fiscal year 2002. In the last few years, the number of breaks have dropped to about one per year, and options to total replacement of the line were investigated.

A value analysis workshop was held at the park July 31–August 2, 2001, to evaluate various options for repairing, upgrading, and/or replacing the waterline. At its conclusion, the preferred alternative was the installation of a leak detection system over the other options discussed in the Alternatives Considered But Dismissed from Detailed Analysis section of this environmental assessment (EA). This option was approximately half the cost of the initial project request to replace the entire line, and provided protection from loss or impacts on natural and cultural resources by avoiding major excavation for a new pipeline.

SCOPING

Scoping is the effort to involve agencies and the general public in determining the scope of issues to be addressed in this EA. Scoping determines important issues and eliminates issues that are not important; allocates assignments among the interdisciplinary team members and/or other participating agencies; identifies related projects and associated documents; identifies permits, surveys, consultations, etc. required by other agencies; and creates a schedule that allows adequate time to prepare and distribute the environmental assessment of effect for public review and comment before a final decision is made. Scoping includes any interested agency, or any agency with jurisdiction by law or expertise (including the Advisory Council on Historic Preservation, the State Historic Preservation Officer (SHPO), and Indian Tribes) to obtain early input.



The Region

FIGURE 1. MAP OF THE REGION

FIGURE 2. PUERCO WELL #1 HOUSE

Internal scoping was conducted by staff of Petrified Forest National Park and resource professionals of the National Park Service, Denver support offices. This interdisciplinary process defined the purpose and need, identified potential actions to address the need, determined the likely issues and impact topics, and identified the relationship of the proposed action to other planning efforts at the national park.

Press releases describing the proposed action were issued in May 2001 and February 2002 (see Appendix 1). American Indian groups traditionally associated with the lands of Petrified Forest National Park were apprised by letter of the proposed action on February 22, 2002 (see Appendix 2). At the request of the Hopi, park management staff met with Hopi tribe representatives to discuss this project. Letters were also sent to the U.S. Fish and Wildlife Service and the U.S. Natural Resources Conservation Service.

Comments were solicited during a public scoping period that ended 08 March 2001, unless an extension was requested. Comments were received from the Hopi Tribe, U.S. National Resources Conservation Service, U.S. Fish and Wildlife Service, and the U.S. Office of Navajo and Hopi Indian Relocation. No concerns or issues were raised, and no other alternatives were proposed.

The undertakings described in this document are subject to section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*). Consultations with the Arizona

SHPO have been ongoing since early in the project. This environmental assessment will also be submitted to the SHPO for review and comment to fulfill Petrified Forest National Park obligations under section 106 (36 CFR 800.8(c), *Use of the NEPA Process for Section 106 Purposes*).

This EA is being distributed for public and agency review and comment for a period of at least 30 days.

RELATIONSHIP OF THE PROPOSED ACTION TO PREVIOUS PLANNING EFFORTS

Improving the park's water system is consistent with the management goals and zoning of Petrified Forest National Park's *Final General Management Plan/Development Concept Plan/Environmental Impact Statement* (NPS 1992), *Statement for Management* (NPS 1996), and *Strategic Plan, 2000–2005*.

ISSUES AND IMPACT TOPICS

Issues

Issues and concerns related to this proposal were identified from past planning efforts and from comments by environmental groups and state and federal agencies. The major issues relate to potential impacts to historic structures, archaeological sites, museum collections, petrified wood and other fossils, biotic communities, park operations, and health and safety.

Derivation of Impact Topics

Specific impact topics were developed to focus discussion and to allow comparison of the environmental consequences of each alternative. These impact topics were identified based on federal laws, regulations, and executive orders; 2001 NPS *Management Policies*; and NPS knowledge of special or vulnerable resources. A brief rationale for each impact topic is given below, as is the rationale for dismissing certain topics from further consideration.

Impact Topics Selected for Detailed Analysis

Cultural Resources. The National Historic Preservation Act (NHPA), as amended in 1992 (16 USC 470 *et seq.*), the National Environmental Policy Act of 1969 (NEPA), NPS Organic Act, NPS *Management Policies* (2001), Director's Order–12: *Conservation Planning, Environmental Impact Analysis and Decision Making* (2001), and Director's Order–28: *Cultural Resources Management Guideline* require the consideration of impacts on cultural resources either listed in or eligible to be listed in the National Register of Historic Places (NRHP). The process and documentation required for preparation of this EA will be used to comply with section 106 of NHPA, in accordance with section 800.8(3)(c) of the Advisory

Council on Historic Preservation's regulations (36 CFR Part 800). This document will be submitted to the Arizona SHPO for review and comment.

Cultural resources include cultural landscapes, historic structures, historic districts, ethnographic resources, and archaeological resources. Petrified Forest National Park contains two cultural landscapes that have been deemed eligible for listing in the NRHP and three that are potentially eligible. The Rainbow Forest Historic Landscape and the Crystal Forest Cultural Landscape comprise the former, and the Puerco River (the prehistoric archaeological landscape has not been fully evaluated), Painted Desert Inn, and Painted Desert Headquarters Cultural Landscapes make up the latter.

According to the National Park Service *Cultural Resources Management Guideline*, a cultural landscape is:

> a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions.

The preferred alternative would not affect the Crystal Forest Cultural Landscape, the potential Painted Desert Inn Cultural Landscape, or the potential Puerco River Cultural Landscape (archaeological) because no undertakings are proposed in the vicinity of the resources.

The Painted Desert Headquarters Complex has recently been recognized as an important example of Mission 66 Program architecture (NPS 1997a). The Arizona SHPO considers the visitor center/headquarters complex to be significant, and it is potentially eligible for the NRHP. The Painted Desert Headquarters could be a cultural landscape. Implementation of the proposed action would not alter the topography, vegetation, circulation features, spatial organization, or land-use patterns of the potential landscape, and any adverse impacts associated with the waterline improvements would be long term, but negligible. In addition, any visual, audible, and atmospheric intrusions associated with construction would be temporary and negligible, lasting only as long as construction. Because the integrity of this potential landscape would be unaffected, cultural landscapes were dismissed. Therefore, the complex is not addressed further in this EA.

The Rainbow Forest Historic Landscape is within the area of potential effect for the proposed action. The existing water distribution system within the developed area is considered a contributing element of the landscape. The structures at Rainbow Forest do not qualify for listing on the NRHP due to loss of integrity. The park staff plans to restore the historic integrity of these structures and does not want to contribute to further loss of integrity. Therefore, historic structures, the Rainbow Forest Historic Landscape, and archaeological resources are addressed in this EA.

Museum Collections. The undertakings described in this EA are subject to Director's Order–24: *NPS Museum Collections Management* (2000). Museum collections are addressed in this EA.

Biotic Communities (wildlife, vegetation, and threatened and endangered species). NEPA is the basic national charter for protection of the environment. It requires federal agencies to use all practicable means to restore and enhance the quality of the human environment and to avoid or minimize any possible adverse effects of their actions upon the environment. NPS policy is to protect the natural abundance and diversity of naturally occurring biotic communities within national park units. Because the waterline alternatives in this document have the potential to affect biotic communities, this impact topic will be addressed.

Petrified Wood and Other Fossils. Petrified Forest National Park was established primarily to preserve outstanding deposits of petrified wood and other fossil resources. Petrified wood and fossil sites are scattered throughout the park and are in areas crossed by the existing waterline. These resources may be affected by waterline improvements, so petrified wood and other fossils are addressed as an impact topic in this document.

Park Operations. Park operations could be affected by both the no-action and action alternatives. Therefore, park operations are addressed as an impact topic.

Health and Safety. Public health and safety could potentially be affected by the no-action and action alternatives, so this topic is addressed in the EA.

Impact Topics Dismissed from Detailed Analysis

Indian Trust Resources. Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United Sates to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources in Petrified Forest National Park. The lands comprising the park are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, Indian trust resources were dismissed as an impact topic.

Ethnographic Resources. The park is adjacent to the Navajo reservation, and the White Mountain Apache, Hopi, and Zuni reservations are all within 80 miles of the park. The cultures of these people are inextricably bound with the lands once occupied by their ancestors. They view much of the park landscape as spiritually active, containing sites vital to the continuation of their lifeways. Although more than one American Indian ethnic group shares some ethnographically significant resources, most are unique to specific tribes. The park considers ethnographic sites significant and is committed to their preservation, protection, and confidentiality.

There are no known ethnographic resources in the waterline improvement project area. Copies of the EA will be forwarded, however, to tribes for review and comment. If the tribes identify ethnographic resources in the project area, appropriate mitigation measures will be undertaken in consultation with the tribes. The location of ethnographic resources will not be made public.

Since there are no known ethnographic resources within the project area at this time, this topic will not be addressed further in the EA unless new information becomes available.

Soundscapes and Lightscape Management. In accordance with the NPS *Management Policies* (2001) and Director's Order–47, *Sound Preservation and Noise Management*, an important part of the NPS mission is preservation of natural soundscapes associated with national park units. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units, as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

In accordance with the NPS *Management Policies* (2001), the National Park Service strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human-caused light.

Noise associated with waterline construction activities would be short term and localized, and activities would be scheduled to minimize effects on visitor experiences. Overall effects would be negligible. Lightscapes would not be affected by the proposed waterline improvements. These topics were therefore dismissed from detailed analysis.

Soils. Total soil disturbance for this project is estimated at 51,200-cubic feet (1,896-cubic yards). Along the south waterline, replacement of the air relief valves would not generally require excavation unless a new vertical riser pipe is needed. The isolation and drain valves would require excavation for removal and replacement. Installation of new pressure gauges would require excavations. Excavations to replace or install valves would generally involve using a backhoe equipped with a 2-foot wide bucket. Excavations would be about 4- to 5-feet deep, 8- to 10-feet long, and 4 feet (maximum width) at the valve location. There would be approximately 200-cubic feet of soil disturbance per excavation. Disturbed soil would total approximately 9,000-cubic feet (333-cubic yards), including excavations for new pressure gauges.

From the Rainbow Forest reservoir to the Rainbow Forest developed area, the soil disturbance would be approximately 24,000-cubic feet (889-cubic yards). A segment of new trench may be needed to avoid CCC-built rock features. If necessary, 1,500-cubic feet (56-cubic yards) of previously undisturbed soil would be disturbed.

There would be approximately 50-cubic feet of soil disturbance per excavation at the Painted Desert Headquarters. This would total approximately 2,200-cubic feet (82-cubic yards). The amount of soil disturbance at the Rainbow Forest developed area would be approximately 16,000-cubic feet (592-cubic yards).

Soil disturbance would be short term, generally limited to narrow corridors and small areas, and would be confined to previously disturbed areas, except as noted above. Overall, impacts of this project on soils would be negligible. Therefore soils were dismissed from detailed analysis.

Geologic Hazards. There are no specific geologic hazards such as earthquakes, volcanoes, or landslides in the project area. Therefore soils and geologic hazards were dismissed from detailed analysis.

Wilderness Values. The two wilderness units within the park were designated by Congress and are legally protected as wilderness in perpetuity. The *2001 NPS Management Policies* (NPS 2001a) requires the administration of NPS-managed wilderness in such a manner as will leave them unimpaired for future use and enjoyment as wilderness. All proposed waterline improvements are located well away from and out of sight of park wilderness areas. They would not affect wilderness values, so this topic was dismissed from detailed analysis.

Water Resources, Including Wetlands, Floodplains, and Water Quality. Executive Orders 11988 ("Floodplain Management") and 11990 ("Protection of Wetlands") require an examination of impacts to floodplains and wetlands, and examination of potential risk involved in placing facilities within floodplains, and protecting wetlands. The 2001 *NPS Management Policies* (NPS 2001A), Director's Order–2 (*Planning Guidelines*), and Director's Order-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-making*) provide guidelines for proposals in wetlands and floodplains.

There are no jurisdictional or NPS-defined wetlands within the project area.

The water distribution system at Rainbow Forest would be replaced in the preferred alternative. A small portion of this distribution system (the line serving the Rainbow Forest concessions buildings) is located within the 500-year floodplain. It is not within the 100-year floodplain, however, which is the regulatory floodplain for such actions. In any case, any impacts to floodplains resulting from excavating and refilling a new waterline trench would be temporary—occurring only if a major flood event occurs during construction—and negligible. The chance of flooding during one year within the 500-year floodplain is 0.2 percent and the chance of flooding during one year within the 100-year floodplain is one percent (NPS Special Directive 93-4, *Floodplain Management*).

The 1972 Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, is a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters; to enhance the quality of water resources; and to prevent, control, and abate water pollution. The 2001 *NPS Management Policies* (NPS 2001a) provides direction for the preservation, use, and quality of water in national parks. Impacts to water quality from implementation of the preferred alternative would generally be avoided, but some temporary, localized sedimentation could occur if rain or snow falls during excavation of waterline trenches. Such impacts would be mitigated by scheduling work in the vicinity of washes during the dry season, and by using silt fences and other best management practices as appropriate. Impacts to water quality would be negligible as a result.

Because 1) there would be no impacts to wetlands, 2) impacts to floodplains would be negligible, and 3) impacts to water quality would be negligible, water resources was dismissed as a detailed impact analysis topic.

Air Quality. The 1963 Clean Air Act, as amended (42 USC 7401 *et seq.*) requires land managers to protect air quality. Section 118 of the Clean Air Act requires parks to meet all

federal, state, and local air pollution standards. *NPS Management Policies* (2001) addresses the need to analyze potential impacts to air quality during park planning. Petrified Forest National Park is classified as a Class I air quality area under the Clean Air Act, as amended. The Clean Air Act also states that the federal land manager has an affirmative responsibility to protect the park's air quality-related values (including visibility, plants, animals, soils, water quality, cultural and historic resources and objects, and visitor health) from adverse air pollution impacts.

Implementation of the proposed action would temporarily affect local air quality through increased dust and vehicle emissions. Hydrocarbon, nitrous oxide, and sulfur dioxide emissions would be rapidly dispersed by the prevalent winds in the project area. Dust stirred up by construction equipment would increase airborne particulates intermittently, but this phenomenon is not expected to be appreciable. Mitigating measures such as water sprinkling to reduce dust and limiting idling of construction equipment would be used, as appropriate, to mitigate effects.

Overall, impacts to air quality from dust and construction equipment emissions would be negligible and temporary. Effects would occur only during construction; no long-term, adverse effects would be expected. Therefore, air quality was dismissed from detailed analysis.

Visitor Experience. Providing for visitor enjoyment is one of the main purposes of the National Park System according to the Organic Act. Petrified Forest National Park's purpose, mission, and significance statements reaffirm the importance of recreational values, visitor experience, and visitor understanding.

Initially, there was concern that scenic views from Jasper Forest and Newspaper Rock overlooks might be degraded by waterline construction activities. These locations were visited to evaluate the potential for such visual impacts. At Jasper Forest it was determined that construction activities would be visible, but they would be so far distant that their impact on visitor experience would be negligible. The Newspaper Rock overlook is much closer to the waterline, but waterline valves to be replaced or installed are located outside the predominant line of sight. Thus, effects would be negligible there too. Potential impacts to visitors from disruption of water service are covered under the "Park Operations" impact topic. Because impacts to visitor experience would be negligible or are covered elsewhere, this impact topic was dismissed from detailed analysis.

Socioeconomic Environment. The proposed action would not change local or regional land use or transportation, nor would it appreciably affect local businesses or agencies. Implementation of the proposed action could provide a negligible beneficial impact to the economies of Holbrook, Arizona, and Navajo and Apache Counties (e.g., minimal increases in employment opportunities for the construction work force and revenues for local businesses and government from construction activities and workers). Construction activities for the preferred alternative are projected to take nine months and require three to five workers. Any benefit to the economy would be temporary (lasting only during construction) and negligible overall. Therefore, the socioeconomic environment was dismissed as an impact topic.

Prime and Unique Farmlands. In August 1980, the CEQ directed that federal agencies assess the effects of their actions on farmland soils classified by the United States Department of

Agriculture's Natural Resources Conservation Service as prime or unique. Prime or unique farmland is defined as soil which particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to a letter from the Natural Resources Conservation Service dated 21 June 2001, the proposed project is exempt from the requirements of the Farmland Protection Policy Act because there are no prime farmlands associated with the project area, and there are no potential impacts that would directly affect wetland areas associated with agriculture. Therefore, prime and unique farmlands were dismissed from detailed analysis.

Ecologically Critical Areas, Wild and Scenic Rivers, Other Unique Natural Areas. No areas within the park have been designated as ecologically critical, and there are no existing or potential Wild and Scenic Rivers within the park. The national park is an important natural area, and the alternatives would not threaten the qualities and resources that make the park special. This topic was therefore dismissed from detailed analysis.

Environmental Justice. Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. No alternative would have health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996). Environmental justice was dismissed from detailed analysis.

ALTERNATIVES

INTRODUCTION

This section describes two alternatives for waterline improvements at Petrified Forest National Park. Alternatives were developed to provide safe and reliable drinking water while preventing loss of natural resources and cultural resources, and to improve operational efficiency, sustainability, and health and safety.

ALTERNATIVE A: NO-ACTION ALTERNATIVE

This alternative refers to a continuation of existing conditions without implementation of the proposed action. Implementation of the no-action alternative means that the waterline would not be improved. With this alternative, the park would continue using and maintaining the existing waterline and appurtenances.

Currently, pressure gauges and a water meter at Puerco Well #2 House are checked daily. If a leak is suspected, locating the leak can require a seven-person crew for one to two days. Once the leak is found, repair of the line requires three or four maintenance staff. Leaks are generally located by looking for wet spots or water pooling in the soil. Sometimes the leaked water runs some distance underground before reaching the surface. Existing valves are rarely used to locate leaks due to their fragile condition and a tendency to seize open or closed.

At Painted Desert Headquarters, many of the valves have broken and have not been replaced. Therefore, when a break occurs, water to the entire complex is shut down during repairs because segments of the headquarters water supply system can no longer be isolated.

The no-action alternative is prescribed by CEQ regulations and serves as a benchmark for comparing the management direction and environmental consequences of the preferred alternative. Should the no-action alternative be selected, the park would respond to future needs and conditions associated with the waterline without major actions or changes from the present course.

ALTERNATIVE B: PREFERRED ALTERNATIVE

The 1986 waterline evaluation prepared by Conceco Engineering, Inc. concluded that the asbestos-cement south waterline and the asbestos-cement lines at Rainbow Forest and Painted Desert Headquarters had an estimated 50 years of remaining life. Initial designs have been completed on a leak detection system as the preferred alternative so that the pipeline would remain functioning for its expected life.

Under this alternative, the existing pipeline would remain in use for most of the line, and air relief, isolation, and drain valves would be replaced at 25 to 30 locations along the south waterline. In addition, pressure gauges would be installed at 15 locations to help locate leaks.

To minimize surge pressures and gasket failure, the park would closely regulate the rate of valve opening and closing.

In the event of a leak, the park would contract for professional leak-detection services. After a leak is located, the park would repair the leak using custom Dresser repair couplings. As part of this contract, special custom Dresser repair couplings would be provided to fix future breaks in the waterline. The repair coupling has an anticipated useful life equal to that of the pipeline being repaired. Additional couplings would be provided to the park for future breaks.

The waterline from the Rainbow Forest reservoir to the Rainbow Forest developed area would be replaced. Existing waterlines at Rainbow Forest developed area would be abandoned in place and new water pipes would be installed. Valves and hydrants would be replaced at Painted Desert Headquarters, and automatic fire suppression sprinklers would be installed at Rainbow Forest Museum and residences. The following summarizes four segments of the project. For more details, refer to *South Waterline Improvements, Title / Submittal, PEFO 200, PMIS 8258, April 2002* (Richard P. Arber Associates 2002). See Appendix 3 for Sample Plans.

Waterline Segment Between the Rainbow Forest Reservoir (mesa top) and Rainbow Forest Developed Area. This entire pipeline segment (approximately 3,300 feet) would be replaced. The 1930s-era pipeline is a 4-inch diameter asbestos-cement pipe. An 8-inch diameter pipe is necessary to provide sufficient water pressure and flow for the fire suppression system. The new pipe would be PVC pipe.

Initial engineering plans called for the old pipe to be abandoned in place and the new pipe to be offset horizontally about six feet from the old pipe. However, a recent site reconnaissance revealed that a 700-foot section of the new pipeline would run through a petrified wood deposit containing large logs and sandstone outcroppings; and that hard-rock excavation would be required to excavate a new trench on top of the mesa, down the face of the mesa, and at the base of the mesa. The existing waterline would be vulnerable to damage in areas of hard-rock excavation. The desire of the park staff is to minimize new disturbance. The revised recommendation is to excavate the 1930s trench and either lay new pipe on top of the existing pipeline if sufficient depth is available, or remove the 1930s pipeline and lay the new pipeline in the old trench. A minimum depth of three feet is required for the new pipeline to prevent freezing. The exact depth of the existing line is unknown.

A 150-foot section of new trench may need to be dug around the base of the original (1930s) reservoir in order to avoid CCC-built rock features. This is currently under investigation by the park staff and Arber Associates (project designer).

The new pipeline would be installed using conventional open trench construction. A trenching machine or backhoe would be used on all but the steepest slopes, where trenches would be hand excavated instead. A temporary bypass pipeline would need to be installed during construction to maintain water service to the developed area.

Waterline Segment Between the Rainbow Forest Reservoir and Puerco Well #2 House ("south waterline"). This waterline segment is in good condition and would not be replaced as part of this construction package. Approximately 25 to 30 appurtenances (isolation valves, air relief valves, and drain valves) in this segment would be replaced. Approximately 15 new

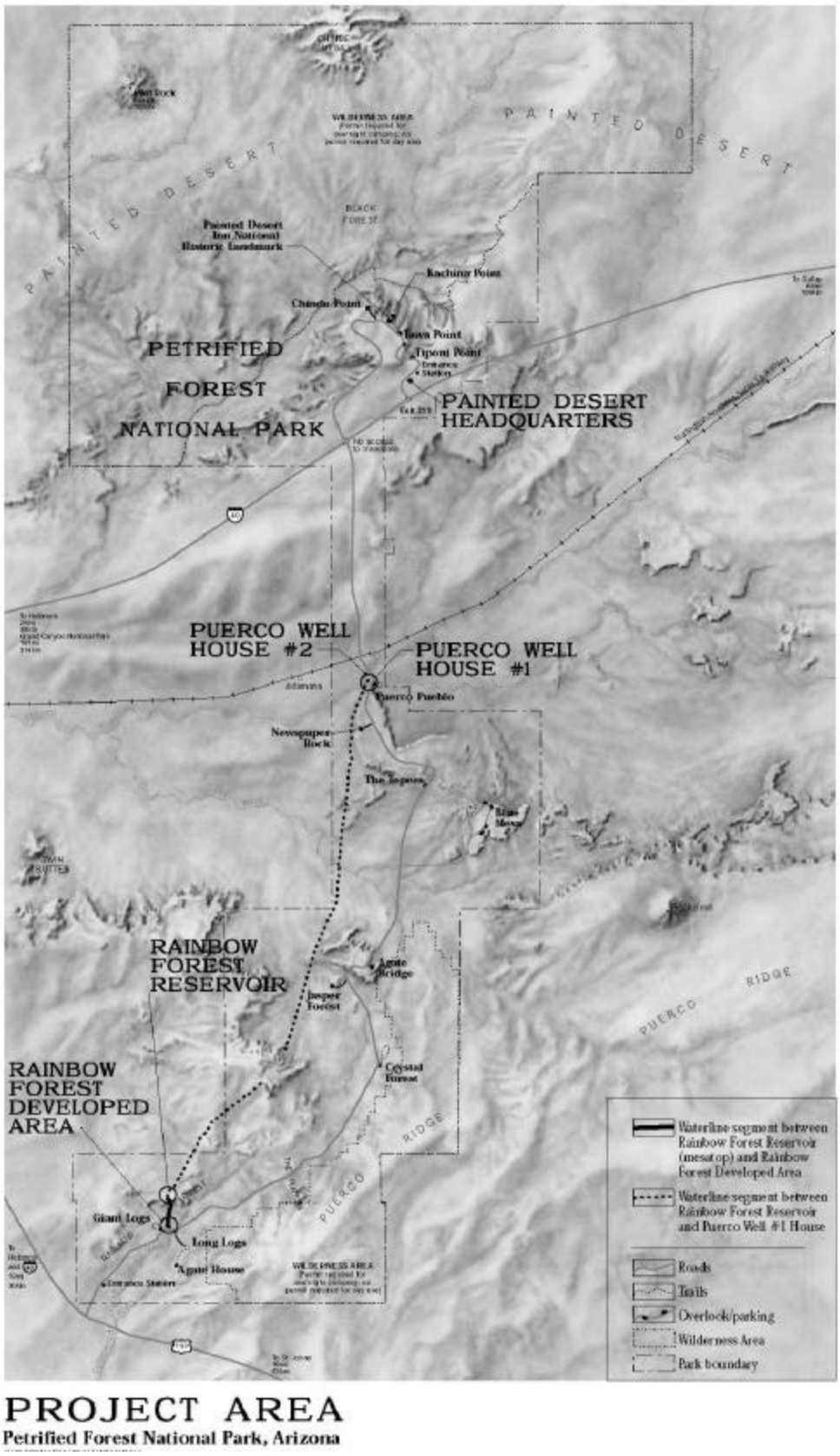


FIGURE 3. PARKWIDE PREFERRED ALTERNATIVE MAP

pressure gauges would be installed in new vaults containing the new isolation valves to make maintenance and troubleshooting of the line easier. The new valves would allow park staff to isolate portions of the waterline to more easily find and fix breaks. The project design firm would determine the best location for the new valves and then consult with park staff to revise the proposed locations, as needed, to avoid areas containing sensitive cultural and natural resources.

Approximately one mile of waterline traverses private land north of Rainbow Forest. The right-of-way easement for the pipeline outside the park boundary dates to 23 June 1939. The current property owner is Twin Buttes Cattle Company, LLC. Valve replacement would occur along the right-of-way outside the park boundary. Modifications to this section of the waterline would be kept to a minimum. The waterlines supplying Puerco Pueblo and Agate Bridge would eventually be abandoned when planned vault toilets are installed. No work is planned for these water service lines.

FIGURE 4. LOCATION SOUTH OF WATERLINE

Painted Desert Headquarters Complex. Proposed improvements at the Painted Desert Headquarters Complex would include replacing four fire hydrants, approximately 29 gate valves, and 11 water services (meters). No work is anticipated inside the buildings at the Headquarters Complex.

FIGURE 5. WATER SERVICES AT PAINTED DESERT HEADQUARTERS COMPLEX

Rainbow Forest Developed Area. The existing asbestos-cement water distribution system enters the Rainbow Forest developed area just east of building 53A, a residence on the north side of the complex. The existing water distribution lines would be abandoned in place and an entirely new system of PVC pipe would be installed. The old system must function while the new one is installed, so the new pipe will be offset horizontally about six feet from the old pipe.

Fire suppression (wet pipe) sprinkler systems would be installed in 11 units or structures at Rainbow Forest. These buildings include the museum and residences, but not the concessions buildings. New service lines to the sprinkler system would be installed. Existing fire hydrants would be replaced.

The waterline improvements would take roughly nine months to complete. The 200,000-gallon reservoir above Rainbow Forest would have to be refilled periodically during this time so that water service to Rainbow Forest is not interrupted. Domestic water use at Rainbow Forest averages 4,000 gallons/day. A fire protection reserve of 60,000 gallons is also required (NPS 2001c).

FIGURE 6. RAINBOW FOREST DEVELOPED AREA

Mitigation Measures for the Preferred Alternative

Construction zones would be identified and fenced with construction tape or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum areas required for the project. All protection measures would be clearly stated in the construction specifications and workers would be instructed to avoid areas beyond the construction zone. Some materials may be stockpiled at the park boneyard, but no materials would be removed from the park. These materials would also be archaeologically cleared before park purchase, as to ensure that no cultural resources (including sacred sites) were impacted by the vendor's activities.

Local borrow and stone material, if required, would be available through sources in the vicinity of Holbrook, Arizona, and would be certified weed free. To further avoid the introduction of exotic plant species, hay bales would not be used to control soil erosion. Hay often contains seeds of undesirable or harmful alien plant species. Therefore, on a case-by-case basis, the following materials may be used for any erosion control dams that may be necessary: rice straw, straws determined by the National Park Service to be weed free (e.g., Coors barley straw or Arizona winter wheat straw), cereal grain straw that has been fumigated to kill weed seed, and wood excelsior bales.

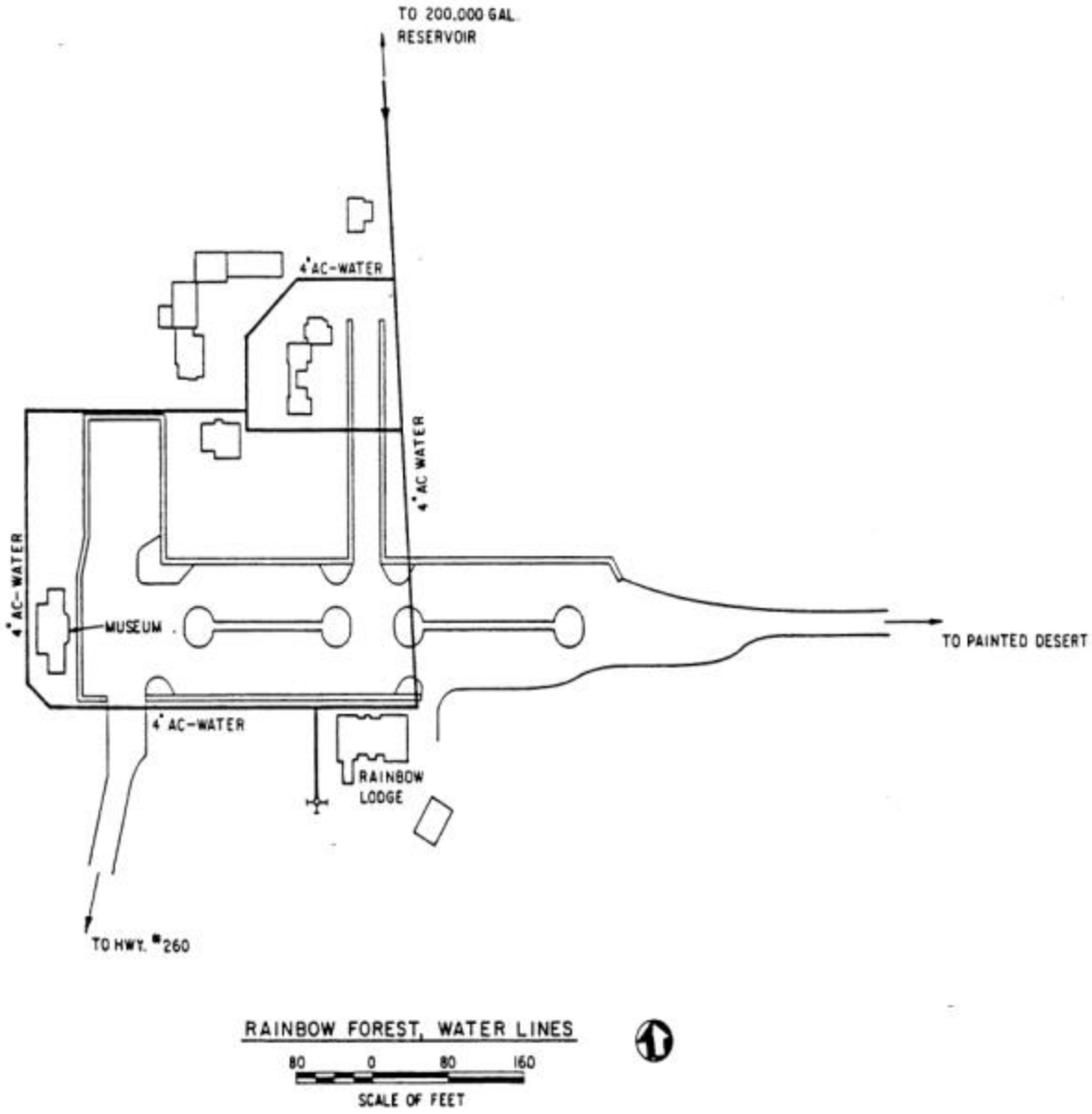


FIGURE 7. RAINBOW FOREST WATERLINES (EXISTING)

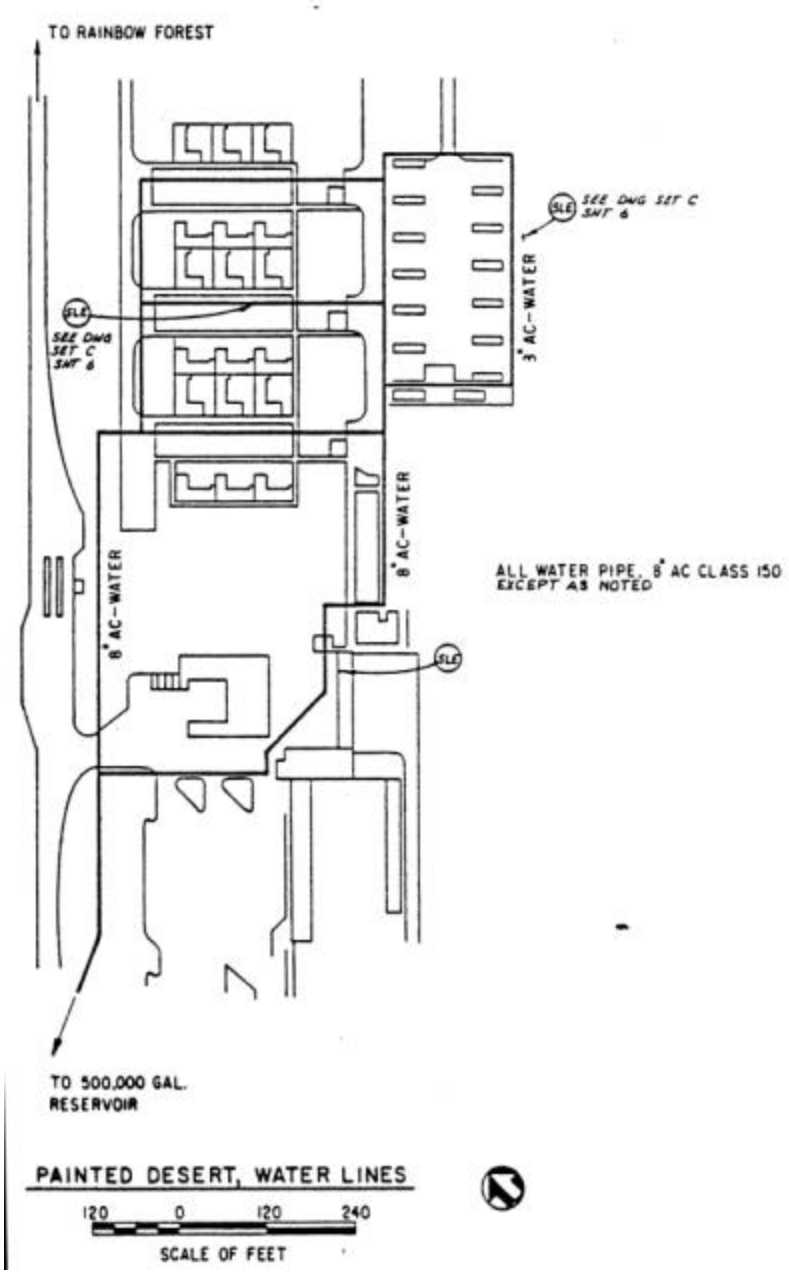


FIGURE 8. PAINTED DESERT WATERLINES (EXISTING)

Excavations in the vicinity of natural washes would be undertaken during the dry season. Silt fences or bales and other best management practices would also be used as appropriate to minimize erosion and sedimentation. Water sprinkling to reduce dust and limiting idling of construction equipment would be used, as appropriate, to mitigate potential air quality effects during construction.

Trenching operations would utilize a rock saw, backhoe, and/or trencher. As the trench is dug, the excavated material would be side-cast for storage. When trenching is complete, bedding would be placed and compacted in the bottom of the trench, and the pipeline would be installed in the bedding. Backfilling and compaction would begin immediately after the lines are placed into the trench, and the trench surface would be returned to pre-construction contours. All trenching operations would follow guidelines to minimize vegetation disturbance and restore affected areas to their original form wherever possible, as approved by park staff.

Topsoil from excavations would be removed and stockpiled. Local topsoil would help preserve microorganisms and seeds of native plants in the soil. The topsoil would be re-spread as close to its original location as possible.

Construction activities would be conducted in previously disturbed areas (e.g., the existing waterline road or the Rainbow Forest developed area) to the extent possible. Staging areas for construction vehicle and equipment storage and for turnarounds, would be located in previously disturbed areas and would be clearly identified in advance. Construction workers and supervisors would be informed about the special sensitivity of Petrified Forest National Park resources (such as petrified wood and archaeological resources) and the laws and guidelines to ensure their protection.

If archaeological sites cannot be avoided, the information they possess regarding prehistoric and/or historic lifeways would be recorded and recovered in consultation with the Arizona SHPO and interested federally recognized Native American tribes. If previously unknown archaeological resources are discovered during construction activities, all work in the immediate area of the discovery would cease until the resources could be identified and documented. Work could resume only after an appropriate mitigation strategy is developed in consultation with the Arizona SHPO and after archaeological clearances are obtained.

In compliance with the Native American Graves Protection and Repatriation Act of 1990, the National Park Service would also notify and consult with concerned tribal representatives for the proper treatment of human remains, funerary, and sacred objects should these be discovered during the course of the project.

If cultural resources that would be adversely impact by the proposed action are NRHP eligible or listed resources, the park will consult with the SHPO. A memorandum of agreement, in accordance with 36 CFR Part 800.6[c], *Resolution of Adverse Effects-Memorandum of Agreement*, must be executed and implemented between Petrified Forest National Park and the Arizona SHPO to resolve the adverse effects to archeological resources. The memorandum of agreement would stipulate how the adverse effects would be mitigated. Because of the adverse effects to archaeological resources, the memorandum of agreement must be negotiated and signed before the Finding of No Significant Impact (FONSI) can be signed.

Sustainability. The National Park Service has adopted the concept of sustainable design as a guiding principle of facility planning and development. The objectives of sustainability are to design NPS facilities to:

- minimize adverse effects on natural and cultural values,
- reflect their environmental setting,
- maintain and encourage biodiversity,
- construct and retrofit facilities using energy-efficient materials and building techniques,
- operate and maintain facilities to promote their sustainability, and
- illustrate and promote conservation principles and practices through the sustainable design and ecologically sensitive use.

Essentially, sustainability is living within the environment. The proposed action subscribes to and supports the practice of sustainable planning, design, and use of the waterline and associated public and administrative facilities services by it.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

During the Value Analysis workshop conducted in 2001, five additional alternatives were examined and discussed in detail. Through the "Choosing By Advantages" evaluation process, these alternatives were eliminated from further analysis.

Trench with 15 Percent Slipline with Pipe Bursting. A new pipeline of 30-gallons per minute (gpm) would be installed parallel to the existing south waterline, either directly above the existing 4- to 5-foot deep pipeline or horizontally offset several feet. Where the pipeline passes through resource sensitive or difficult to construct areas, estimated to be 15 percent of its total length, the existing asbestos-cement line would be sliplined to 3-inch diameter using pipe-bursting technology. This alignment would be the shortest route to Rainbow Forest reservoir. Service laterals to Puerco Pueblo and Agate Bridge are too small for sliplining and would require construction up rugged slopes. Conventional trenching techniques would be used where possible and hand excavation would be required in the limited areas of rough terrain. The pipeline would be out of service for extended periods during construction. With 200,000 gallons of storage at Rainbow Forest, pipeline shutdown for 30 days at a time is considered feasible. New pipeline in the developed areas would be installed using conventional trenching. Old pipelines would be abandoned in place. This alternative was dismissed due to the high cost of initial construction and higher life cycle costs.

Slipline to Smaller Dimension. The existing 3-inch asbestos-cement transmission line would be slip-lined with 2-inch high-density polyethylene pipe. The existing 2.5-inch asbestos-cement line would also be lined with 2-inch high-density polyethylene pipe using pipe-bursting technology. Two-inch liner is considered the smallest feasible diameter for this project. This alternative would reduce line-flow capacity to about 9-gpm or about 13,000 gallons per day (gpd). Ground disturbance would be much less than with continuous trenching. Excavations of approximately 30-feet in length would be required at estimated 500- to 1,000-foot intervals, for introduction and pulling of liner pipe. Excavations would also be required at 25 to 30 locations along transmission piping for replacement of all air relief, isolation, and drain valves. New pipelines in the developed areas would be installed using conventional trenching. Old pipelines

would be abandoned in place. Although this alternative rated high for operational efficiency and protection of resources, it was dismissed because the construction cost is twice that of the preferred alternative and life cycle costs are also higher.

Trench Along Main Park Road. A new transmission pipeline, of approximately 30-gpm capacity, would be installed in the main park road right-of-way over its entire length, from Puerco River to Rainbow Forest. The line would then leave the highway and traverse to the Rainbow Forest Reservoir. Conventional trenching techniques would be used where possible and hand excavation would be required in the limited areas of rough terrain. Excavation scars would be visible until revegetation was complete. Construction would be difficult at several locations for a total estimated distance of three miles. New transmission pipeline length would be approximately 16.3 miles, 4.2 miles longer than the existing asbestos-cement line. The service line to Agate Bridge would be 1.2 miles shorter. This alternative would afford easier access for pipeline inspection and maintenance. New pipelines in the developed area would be installed using conventional trenching. Old pipelines would be abandoned in place. This alternative was dismissed because the level of new disturbance outweighed the amount of land reclaimed, and due to higher costs for construction and life cycle operation.

Haul Water to Rainbow Forest. Water use along the south pipeline is currently estimated at 4,000-gpd. Available water storage is 200,000 gallons and required fire protection reserve is estimated at 60,000 gallons (500 gpm x 120 minutes). Park management recognizes that there is an aging leach field at Agate Bridge that may not be feasible to replace, and that there are a number of concerns related to the existing restroom facilities at Agate Bridge and Puerco Pueblo, and also the lagoons at Puerco. As a result, management is considering alternatives, including converting from water-based toilets to vault toilets at these areas. Thereby, eliminating water demand along the main park road between Puerco River and Rainbow Forest.

This alternative would require that water be hauled from the Painted Desert Headquarters or Puerco pump house to the Rainbow Forest reservoir. With a 6,000-gallon tank truck, an average of one load every 1.5 days would be required. A truck fill hydrant would be required at Painted Desert or Puerco River. Distribution system and valve replacement in the Painted Desert and Rainbow Forest developed areas would require excavation. This alternative would provide for the current level of water use, but might preclude options for future development in the south half of the park. Truck operation and additional labor hours would necessitate an increase in park base funding. New pipelines in the developed area would be installed using conventional trenching. Old pipelines would be abandoned in place. This alternative was dismissed because of the increase in operational costs and requirements.

Utilize Existing Well at Rainbow Forest. A well was dug at Rainbow Forest in 1932, and it was deepened in 1934. The well water had a high salt content, however, and was unsuitable for all but sanitary uses. Potable drinking water continued to be hauled into the area. Another well was drilled in 1984 near the water reservoir at Rainbow Forest. Capacity of this well is 185-gpm. Water from this well is also quite salty (total dissolved solids concentration of 9,950-mg/l). To be potable, the well water would have to be treated by a 5,000-gpd reverse osmosis water treatment plant to an acceptable chemical quality. A reverse osmosis plant would require a high level of operational expertise and would be located near the well in a 600-square foot building. Reject water would be contained in a fenced and lined evaporation pond, impacting an area of about eight acres near the water storage reservoir. Park staff would be required to

perform minimal maintenance on the evaporation pond. The treatment plant would be operated through a maintenance contract, probably requiring weekly onsite visits. New pipelines in the developed area would be installed using conventional trenching. Old pipelines would be abandoned in place. This alternative was dismissed due to high operational requirements and overall costs.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

According to CEQ regulations implementing NEPA, and the National Park Service NEPA guidelines (Director's Order–12), an environmentally preferred alternative must be identified in environmental documents. In order for an alternative to be environmentally preferred, it must meet the criteria established in section 101(b) of NEPA and subsequently adopted by the National Park Service. An alternative must meet the following criteria to be considered an environmentally preferred alternative:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative in this environmental assessment is alternative B, the NPS preferred alternative. This alternative and several others described below were analyzed during a Value Analysis and Choosing By Advantages Study conducted in July/August 2001. This alternative was selected as the best value when considering construction costs, life-cycle costs, and other advantages considered, such as:

- Preventing loss of natural resources
- Preventing loss of cultural resources
- Protecting public health, safety, and welfare
- Improving operations efficiency and sustainability
- Protecting employee safety and welfare

In short, this alternative would minimize disturbance to known resources; limit introduction of new man-made features into the environment; preserve the historic pipeline; provide good protection of public and employee health, safety, and welfare; and improve day-to-day operations. Construction costs are estimated at $1,710,215, and life-cycle costs would be $2.5 million. See *Value Analysis/Choosing By Advantages Study* (NPS 2001c), for details.

COMPARATIVE SUMMARY OF NO-ACTION AND PREFERRED ALTERNATIVES

TABLE 1. COMPARATIVE SUMMARY OF ALTERNATIVES

Alternative A: No-Action	Alternative B: Preferred Alternative
There would be no improvements to the park's water delivery systems. Automatic fire suppression sprinkler systems would not be installed at Rainbow Forest.	The existing south waterline (between Puerco and Rainbow Forest water reservoir) would remain in use. Air relief valves, isolation valves, and drain valves would be replaced at 25 to 30 locations, and pressure gauges installed at 15 locations along the waterline. The purpose of the new valves and gauges is to reduce the likelihood of waterline leaks and aid in detecting leaks if they do occur. A new waterline would be installed from the Rainbow Forest reservoir to the Rainbow Forest developed area. The new line would be installed in the existing trench. The old line would be left in place where there is adequate depth for the new line, or removed. Existing waterlines at Rainbow Forest developed area would be abandoned in place and new waterlines would be installed. Fire suppression sprinklers would be installed at the Rainbow Forest Museum and residences. Water system valves and hydrants would be replaced at Painted Desert Headquarters.

The preferred alternative meets the project objectives of providing a reliable, safe source of water to the Rainbow Forest area and other areas of the park, enhancing fire suppression capabilities to better protect lives and historic structures, and increasing operational efficiency.

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COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

TABLE 2. COMPARATIVE SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

Potential Environmental Impacts		
Impact Topic	**Alternative A: No-Action**	**Alternative B: Preferred Alternative**
Historic Structures and Landscape	No new impacts to historic structures and landscapes. Continued lack of fire suppression systems could result in damage or total loss of buildings at Rainbow Forest, a potential long-term, minor to moderate adverse impact to historic structures and the landscape.	Buildings would retain integrity while new fire suppression systems would afford them better protection. Impacts to structures would be long term, beneficial, and minor. Impacts to the landscape would be short-term, adverse, and negligible. Impacts to the pipeline would be long term, adverse, and minor.
Archaeological Resources	Archaeological sites near the waterline could be disturbed or damaged by flooding from waterline breaks, a long-term, adverse, and minor impact.	Archaeological resources would be avoided to the maximum degree possible. Ground disturbing activities associated with waterline repairs would have short-term, negligible to minor, adverse impacts, depending on the nature of the archaeological resource and level of mitigation. Fewer waterline breaks, better leak detection, and faster repairs would have long-term, minor to moderate benefits to archaeological resources.
Museum Collections	Museum collections exhibited at Rainbow Forest Museum would remain susceptible to damage or destruction from fire, a potential long-term, moderate, adverse impact.	Installation of fire suppression sprinklers in the Rainbow Forest Museum would provide better fire protection for museum collections exhibited there, and the museum would come closer to meeting NPS standards for curation. The impact would be long term, beneficial, and minor.
Biotic Communities	No new impacts to biotic communities.	With mitigation, short-term, minor adverse impacts on vegetation would be expected. Some wildlife would be temporarily disturbed or displaced during construction, a short-term minor, adverse impact. With appropriate mitigation, no adverse impacts to threatened, endangered, or special concern species, or their habitat, would be expected.
Petrified Wood and Other Fossils	Petrified wood or fossil areas near the waterline could be disturbed or damaged by flooding from waterline breaks, a long-term, adverse, negligible to minor impact.	New potential (limited) for petrified wood disturbance in and near Rainbow Forest during trenching and placement of new waterline segments. New potential (also limited) for petrified wood theft by waterline workers. Impacts are projected to be long-term, adverse, and minor.
Health and Safety	Risks from water contamination, construction accidents, and asbestos exposure during waterline repairs would remain a long-term, minor, adverse impact. Fire safety at Rainbow Forest would remain sub-optimal due to low water delivery capacity, erratic water pressure, and lack of automatic sprinklers, a long-term, moderate, adverse impact.	Impacts from exposure to asbestos would be short-term, adverse, and negligible to minor. Reduced risks of water contamination and construction accidents would have minor, long-term, beneficial impacts on human health and safety. Fire suppression at Rainbow Forest would improve substantially, a long-term, minor, beneficial impact on human safety.
Park Operations	Impacts to park operations would be adverse, long term, and minor to moderate, depending on the incidence of future waterline problems.	Water service interruptions due to construction would have a short-term, minor adverse impact on operations. Waterline improvements would have a long-term, moderate, beneficial impact on operations once construction is complete.

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AFFECTED ENVIRONMENT

Detailed information on resources of Petrified Forest National Park can be found in *the General Management Plan* (NPS 1993) and the park *Resources Management Plan* (NPS 1998). A description of the park and resources potentially affected by the waterline project follows.

LOCATION AND GENERAL DESCRIPTION OF THE PARK

Petrified Forest National Park is located in northeastern Arizona, about 100 miles east of Flagstaff, Arizona, and about 70 miles west of Gallup, New Mexico. The park lies within Navajo and Apache Counties. It is bordered by the Navajo reservation to the north and northwest and by Hopi-owned land, private lands, state trust lands, and U.S. Bureau of Land Management lands to the south, east, and west. Several other Indian reservations and national forests are nearby. Interstate Highway 40 and the Burlington Northern–Santa Fe Railroad transect the park from west to east.

Petrified Forest National Park features one of the largest and most colorful concentrations of petrified wood in the world. Exposures of the 225-million-year-old Chinle Formation extend throughout the Painted Desert. Fossils preserved in this formation appear to represent an entire ecosystem. These rare, accessible associations of animal and plant fossils make it possible to learn more about the Late Triassic Period here than anywhere else in the world.

The park also contains historic structures, archaeological sites, petroglyphs, wildlife, and interpretive exhibits. Of the park's 93,533 acres, about 54 percent is designated wilderness, arranged in two units: the Painted Desert unit in the north part of the park (43,020 acres), and the Rainbow Forest unit in the southeast part of the park (7,240 acres). Air quality in the park is usually good, providing opportunities to view scenic vistas, including mountain peaks more than 100 miles away.

The vegetation of Petrified Forest is varied. Soil and terrain conditions have resulted in a mosaic of grass and shrub communities. Sparse stands of juniper are found on rocky upper slopes and mesa caps. A limited stand of pinion-juniper woodland is found on Chinde Mesa, along the park's far northern boundary. Grasslands occupy middle and upper plateau areas where soils are deeper and richer. Since grazing was eliminated from the park in the 1960s, the shortgrass prairie has recovered in many areas. Desert plant communities are found in the lower elevations where soils are heavy and water availability low. The most diverse area for plants is Puerco River corridor; 40 species (30 native to North America) can be found here. Willows, native cottonwoods, and the dominant exotic shrub, tamarisk, are typical of the Puerco River riparian zone. Shrubs typical of the Great Basin and cool desert, such as big sagebrush, shadscale, greasewood, and winterfat also occur in the park.

Park elevation averages 5,600-feet above sea level, resulting in a cool, arid climate. Annual precipitation averages less than 10 inches, about half of which is from late summer thunderstorms. Midsummer temperatures can exceed 100 degrees Fahrenheit (38 degrees Celsius), and nights can be surprisingly cool. Although winter nights are often colder than freezing, daytime temperatures are typically moderate.

PARK VISITATION

Annual park visitation from 1991 to 2000 ranged from 605,312 to 935,185 visitors. Visitation was relatively high in the early 1990s, peaked in 1995, and has declined each year since.

A recent visitor study provides useful information on park visitors (Delost and Lee 2001). Petrified Forest National Park is generally not the primary trip destination for most visitors. The most common other places visitors went on the same trip, or were planning to visit, were Grand Canyon National Park and Meteor Crater. Nearly 80 percent of visitors are visiting the park for the first time. Two-thirds of all visits to the park last between one and three hours. Average group size is three people, but commercial bus tours also stop at the park.

HISTORIC STRUCTURES AND LANDSCAPE

Historic Structures

The buildings of the Rainbow Forest Historic Landscape (built under New Deal work programs, including the CCC) were evaluated for eligibility for listing in the NRHP, separately as historic structures, and found by the Arizona SHPO to be ineligible because their integrity of design, materials, and workmanship has been diminished by significant modification. Architecturally incompatible modifications, including room additions, changes in interior layout, and the addition of pipes, fences, antennas, solar panels, and other amenities of modern living, have also been made to several residences and to the rear of the visitor center/museum building. In finding the buildings ineligible, however, the Arizona SHPO concluded that alterations to buildings 51 and 52 (the west/north and east buildings surrounding the courtyard) could be reversed and recommended a number of actions to bring the structures back into eligibility status. A NPS historical architect evaluated the buildings in detail, and concurred that the structures could be restored to their 1930s appearance (NPS 2001b). The park staff is attempting to reverse the modifications to the buildings as funding permits. The area of potential effect of the undertakings described in this document includes the museum and ten residences and structures at Rainbow Forest.

The CCC Pipeline

In the early 1930s, the area around Puerco Pueblo became part of the park. In 1932, with the completion of the Petrified Forest Highway (the main north-south park road), the area became the park entrance for visitors traveling Route 66. Over the next ten years, the CCC undertook major improvements throughout the park that included, among other things, completing a water pipeline from Puerco well house to Rainbow Forest Headquarters. The pipeline represents a major engineering accomplishment across difficult terrain and desert conditions, and is also associated with the CCC (NPS 2002b). A determination of NRHP eligibility has been submitted to the Arizona SHPO. Although the SHPO did not concur on the eligibility of the waterline (see Appendix 2), the park staff is interested in preserving historic features of the

park and therefore, for purposes of this environmental assessment it will be treated as potentially eligible for the NRHP. The area of potential effect of the undertakings described in this document includes the CCC pipeline from Puerco Well House #1 to the Rainbow Forest Developed Area.

Rainbow Forest Historic Landscape

Rainbow Forest Historic Landscape, which encompasses the Jim Camp Wash bridge; parking plaza and access road; housing complex; museum; concessions building and outbuildings; picnic area; connecting walks; planting islands; Giant Logs trail; and the Long Logs road, trails, and parking area, is eligible to be listed on the NHRP as a historic designed landscape. The Rainbow Forest historic landscape was planned and designed by the National Park Service and, for the most part, constructed by the CCC during the 1930s. When constructed, it was the visitor contact area and headquarters for the park (NPS 1999a).

The contributing elements of the landscape include:

- Rainbow Forest Employee Residence (51-A1)
- Rainbow Forest Employee Residence (52-B)
- Rainbow Forest Employee Residence (52-C)
- Rainbow Forest Employee Residence (52-A)
- Rainbow Forest Employee Residence (51-A)
- Rainbow Forest Employee Residence (53)
- Rainbow Forest Employee Residence (51-A2)
- Rainbow Forest Employee Residence (50)
- Rainbow Forest Employee Garage
- Rainbow Forest Gas and Oil Building
- Rainbow Forest Visitor Center/Museum
- Rainbow Forest Fitness Center
- Rainbow Forest Fire Cache
- Rainbow Forest Storeroom
- Rainbow Forest Warehouse and Shop
- Jim Camp Wash Bridge
- Long Logs parking area
- Rainbow Forest connecting Wall/Fencing
- Agate House
- Rainbow Forest plaza, plaza features, and parking lot
- CCC-constructed waterline
- CCC-constructed 50,000-gallon water reservoir

Most of the structures identified as contributing elements of the Rainbow Forest historic landscape date from the 1930s and were built under the New Deal-era work programs, including the CCC.

Archaeological Resources

Prehistoric resources are extensive in Petrified Forest National Park, and include over 600 recorded sites representing Paleoindian, Archaic, Basketmaker, Puebloan, and Navajo cultures. Pit houses, campsites, multi-room pueblos, projectile points, ceramics, and other resources comprise the park archaeological record. Pictographs are rare, but large concentrations of petroglyphs are etched into the desert varnish that forms on the sandstone that abounds in the park. There is evidence that the park has numerous unrecorded sites within its boundaries. Twelve of the more than 600 recorded sites have been excavated. The others form a regionally significant "data bank" of future scientific information (NPS 1996). Historic archaeological resources are also located throughout the park. The sites represent the expanse of the park's history, from the 19th century to the 1950s. The waterline crosses through one archaeologically sensitive area and through or near 30 known archaeological sites (NPS 2002a). For the purpose of this EA, all sites are treated as potentially eligible for listing on the NRHP. Unknown resources are most likely to be encountered in grassy and sand dune areas.

The pipeline easement on private property has not been surveyed for cultural resources. Park staff are arranging to have this survey conducted.

Museum Collections

The park museum collections currently contain 127,913 cataloged items and 55,053 uncataloged items. These collections include paleontologic, archaeologic, historic, ethnologic, and natural history specimens. The vast majority of the park's onsite museum collections (some items are stored offsite) are housed in the headquarters/visitor center building at the Painted Desert Headquarters Complex. Some items from the museum collections are exhibited at the Painted Desert Inn, Painted Desert Visitor Center, and Rainbow Forest Museum. None of these facilities meet NPS curation standards for fire safety, humidity, temperature, or security. The items exhibited at the Rainbow Forest Museum have the potential to be affected by the preferred alternative.

Biotic Communities, Including Threatened and Endangered Species

This section describes the general biotic environment of the area near the existing pipeline. It includes vegetation, wildlife (birds, mammals, and reptiles and amphibians), and threatened and endangered species (including species of concern and designated critical habitat).

Vegetation. Vegetation along the existing pipeline is characterized as grassland (Parker and Clements 2001) and is dominated by species found in the shortgrass prairie of Petrified Forest National Park. Throughout the park, this plant community is recovering from previous disturbances associated with overgrazing. The recovering grassland vegetation that may be found along the existing pipeline includes alkali sacaton (*Sporobolus airoides*), blue grama (*Bouteloua gracilis*), galleta grass (*Hilaria* spp.), Four winged saltbush (*Atriplex* sp.), golden buckwheat (*Eriogonum flavum*), and Mormon tea (*Ephedra* spp.) (NPS 1992). Isolated, scattered, and sparse stands of one-seed juniper (*Juniperus monosperma*) also occur.

Wildlife. The *Petrified Forest Pipeline Compliance Vertebrate Surveys, Interim Report* (Nowak and Hart 2001) has verified that birds, mammals, reptiles, and amphibians all occur along the existing pipeline. In general, species diversity was greater at the margins of the survey tract along the existing pipeline, near the Puerco sewage lagoons and the Rainbow Forest water reservoir. The habitat in these areas is the most structurally diverse, and each is or was near a water source (the Puerco sewage lagoons and dripping water pipe that has been repaired near Rainbow Forest).

Mammals. Eight small and three large mammal species were observed along the existing pipeline corridor during the vertebrate surveys. The most abundant small mammal was the deer mouse (*Peromyscus maniculatus* –18 individuals), followed by the white-tailed antelope ground squirrel (*Ammospermophilus leucurus* – 9 individuals). Other small mammals that were live-trapped and released included the white-throated woodrat (*Neotoma albigula*), the northern grasshopper mouse (*Onchomys leucogaster*), white-footed mouse (*Peromyscus leucopus*), the brush mouse (*Peromyscus boylii*), and Ord's kangaroo rat (*Dipodomys ordii*). The Apache pocket mouse (*Perognathus apache*) and silky pocket mouse (*Perognathus flavus*) were live-trapped within 500 meters of a site along the existing pipeline during previous surveys. It is possible that they occur in the more grassy habitat supported along the project (Nowak and Hart 2001).

Pronghorn (*Antilocarpa americana*) were observed near the Rainbow Forest water tank and were the most abundant large mammal observed (7 individuals). Through observations of droppings and tracks, coyotes (*Canis lupis*) were determined to be widely distributed throughout the existing pipeline corridor (number of individuals undetermined), while evidence of the desert cottontail (*Sylvilagus audubonii*) was found near the Rainbow Forest water reservoir (Nowak and Hart 2001).

Reptiles and Amphibians. Six reptile species and no amphibian species were live-trapped or observed during surveys conducted for this project (Nowak and Hart 2001). The most abundant species live-trapped was the collared lizard (*Crotaphytus collaris*), and others included the side-blotched lizard (*Uta stansburiana*), the lesser earless lizard (*Holbrookia maculata*), eastern fence lizard (*Sceloporus undulatus*), striped whipsnake (*Masticophis taeniatus*), and the gopher snake (*Pituophis catenifer*). Although not captured during these surveys, the plateau striped whiptail (*Cnemidophorus velox*), the most abundant reptile in the park, is likely to occur along the existing pipeline corridor as well.

Previous studies near the existing pipeline (within 250 meters) indicate two more reptile species and four amphibian species occur near the project site. These include the sagebrush lizard (*Sceloporus graciosus*), the glossy snake (*Arizona elegans*), the tiger salamander (*Ambystoma tigrinum*), the New Mexico spadefoot (*Spea multiplicata*), the plains spadefoot (*Spea bombifrons*), and the Couch spadefoot (*Scaphiopus couchii*) (Nowak and Hart 2001).

Birds. Nineteen bird species have been identified in surveys conducted along the existing pipeline (Nowak and Hart 2001). Their status in the park has been listed as uncommon migrant, rare year-round resident, rare (resident status unknown), uncommon summer resident (breeding), common winter and summer resident, and common year-round resident. The most common birds in the area of the project are the white-crowned sparrow (*Zonotrichia leucophrys),* Say's phoebe (*Sayornis saya),* rock wren *(Salpinctes obsoletus),* Loggerhead

shrike *(Lanius ludovicianus),* house finch *(Carpodacus mexicanus),* and dark-eyed junco (*Carpodacus mexicanus).* Appendix 3 is a complete list of the nineteen bird species, their status, and their distribution along the pipeline.

Threatened and Endangered Species. Under the Endangered Species Act of 1973, as amended, an "endangered species" is defined as any species in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined as any species likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range.

The United States Fish and Wildlife Service was contacted for an inventory of threatened, endangered, or candidate species under the endangered species act that may potentially occur in the project area. Based on the habitat descriptions provided for the threatened, endangered, or candidate species found in the county, their response indicates none of these species are likely to occur near the existing pipeline corridor (Harlow 2001).

Suitable soil and geologic conditions exist in a very limited area near the existing pipeline to support gladiator milk vetch (*Astragulus xiphoides*), although no individuals have been observed in this part of the park. The gladiator milk vetch is an Arizona state species of special concern, and requires management action only when the species occurs on U.S. Forest Service lands under the 1993 Arizona Native Plant Law (Arizona National Heritage Program 2002). The park limits disturbance to this species out of respect for state programs.

There is no designated critical habitat at Petrified Forest National Park.

Petrified Wood and Other Fossils

Paleontologic resources at Petrified Forest National Park, including petrified wood and fossilized paleoflora and paleofauna, are derived from sedimentary deposits of the Late Triassic Period. Over 200 fossilized plant species and 60 fossilized animal species have been described from the Chinle Formation at the park (NPS 1998, 2001b).

A comprehensive survey of petrified wood and other fossil resources of the park is not yet complete. However, many special fossil and petrified wood areas within the park have been identified and mapped by park resource managers and other experts. Petrified wood is scattered throughout the park, but the heaviest concentrations are located south of I-40. Giant Logs and Long Logs, located near Rainbow Forest, have trails that provide visitors with the opportunity to walk through major concentrations of petrified wood, including massive logs. Generally the waterline alignment misses significant concentrations of petrified wood. There is a concentration of petrified wood located north of the Rainbow Forest developed area, however, and the waterline runs through this petrified wood deposit, which includes several large petrified logs.

Petrified wood resources in many areas of the park (e.g., Crystal Forest, Giant Logs, and Long Logs) have been significantly reduced by theft. Petrified wood theft has been a problem at the park since 1906, when the Petrified Forest National Monument was established. An estimated 12 tons of petrified wood is stolen or displaced within the park each year, mostly in small

pieces easily carried from the Rainbow Forest area (NPS 1986). The actual figures are hard to determine because visitors sometimes pick up a piece of petrified wood to examine it and later return it to the desert floor in a new location (Monkevich et al. 1994).

In badlands areas such as Jasper Forest and Rainbow Forest, fossils are gradually exposed by the erosive action of wind and water. Theft of paleoflora and paleofauna fossils is a problem in some areas of the park.

Health and Safety

Breaks in the park waterline present a risk to public health and safety due to the potential for water supply contamination during repair activities. To reduce the likelihood of contamination, park maintenance crews empty and flush the pipeline with clean water after repairs are made.

Park maintenance staff safety is at risk when water pipes break due to the hazards of pipeline excavation and working in open trenches during repair activities. Working with existing asbestos-cement pipe is also considered hazardous because carcinogenic asbestos particles can be released when the pipe is cut or disturbed. Personal protective equipment, such as respirators and body coverings, must be used when asbestos-cement pipe is cut or disturbed (OSHA 2002a).

Rainbow Forest Museum and most of the residential units at Rainbow Forest were constructed in the 1930s and do not have fire suppression sprinklers. The 1930s era waterline at Rainbow Forest is a 4-inch diameter asbestos-cement pipe. The Rainbow Forest waterline and fire hydrants are undersized in terms of modern fire flow demands and water pressure is erratic for unknown reasons.

Park Operations

The Painted Desert Headquarters Complex is located just north of I-40, and includes a visitor center, housing units, maintenance facilities, administrative facilities, and concessions (gift shop, restaurant, gasoline service station/convenience store, and restrooms). The Rainbow Forest developed area is located in the south of the park. It includes the Rainbow Forest Museum/visitor contact station, concessions (gift shop, snack bar, restrooms, and small residence), eight units designed as residences, two garage/storage structures, and a picnic area.

Since 1995, fourteen breaks in the asbestos-cement waterline between Puerco Well #2 House and the Rainbow Forest Reservoir have occurred. Each break requires extensive park maintenance efforts to locate and repair the leak. There is a water pressure monitoring gauge in the Well #1 House, which is located just south of the Puerco River. This gauge is checked daily, and if pressure is found to be low, a park maintenance crewmember must drive the waterline road to look for leaks. If no leak (wet areas or pooled water) is apparent by visual inspection, the crew must close valves sequentially along the line until the water pressure stabilizes. This time-consuming procedure gives a general indication of a leak's location.

There have also been leaks and problems (e.g., frozen valves) in other portions of the water distribution system. When a waterline breaks at the Painted Desert Headquarters Complex, water delivery to the entire complex, including the visitor center, must be shut off. The valves at the headquarters complex and the south waterline are in such bad condition that they may seize open or closed at any time.

Waterline breaks represent a substantial cost to the park for water, equipment and materials, and labor. The park purchases water by the gallon from the Navajo Tribal Utility Authority, so every gallon lost must be paid for at a current cost of approximately $3.40 per 1,000 gallons. Total costs for water, materials, and labor may exceed $2,000 per waterline break.

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This section describes the environmental consequences of the no-action and the preferred alternatives. First, the methods for assessing environmental consequences are discussed. NEPA requires consideration of context, intensity, and duration of impacts, cumulative impacts, and measures to mitigate impacts. Next, is an explanation of resource impairment, which must also be assessed by alternative, according to NPS policy. Subsequent sections in this chapter are organized by impact topic, first for the no-action alternative, then for the NPS preferred alternative.

METHODS FOR ASSESSING IMPACTS

Overall, the National Park Service based impact analyses and conclusions on the review of existing literature and park studies; information provided by park staff; professional judgments and insights of other agencies and officials (e.g., the Arizona SHPO); and input from interested local tribes and the public. Definitions used to evaluate the context, intensity, duration, and cumulative nature of impacts associated with project alternatives are discussed below.

Context is the setting within which an impact is analyzed, such as the affected region, society as a whole, the affected interests, and/or a locality. In this EA, the intensity of impacts are evaluated within a local (i.e., project area) context, while the intensity of the contribution of effects to cumulative impacts are evaluated in a regional context.

For this analysis, *impact intensity* or severity is defined as follows:

Cultural Resources

- Negligible – the impact is at the lowest levels of detection – barely perceptible and not measurable.
- Minor – impact would not affect the character-defining features of a NRHP eligible or listed structure or district.
- Moderate – impact would alter a character-defining feature(s) of the structure or district but would not diminish the integrity of the resource to the extent that its NRHP eligibility is jeopardized.
- Major – impact would alter a character-defining feature(s) of the structure or district, diminishing the integrity of the resource to the extent that it is no longer eligible to be listed in the NRHP.

Museum Collections

- Negligible – impact is at the lowest levels of detection — barely perceptible and not measurable.
- Minor – impact is slight, but detectable; only affects a few artifacts in the collection.

- Moderate – impact is readily apparent; affects many artifacts in the collection.
- Major – impact is severe or of exceptional benefit; affects the majority of the artifacts in the collection.

Biotic Communities

- Negligible – an action that could affect biotic communities or threatened and endangered species habitat, but the change would be so small that it would not be of any measurable or perceptible consequence.
- Minor – an action that could affect biotic communities or threatened and endangered species habitat, but the change would be slight and localized with few measurable consequences, and would not jeopardize a threatened and endangered species.
- Moderate – an action that would result in readily apparent changes to affect biotic communities or threatened and endangered species habitat with measurable consequences.
- Major – a severely adverse or exceptionally beneficial effect to biotic communities or threatened and endangered species habitat or species would result.

Petrified Wood

- Negligible – impact to a site with concentrations of petrified wood is at its lowest levels of detection — barely perceptible and not measurable.
- Minor – impact to a site with concentrations of petrified wood is slight but detectable, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is barely perceptible and difficult to measure.
- Moderate – impact to a site with concentrations of petrified wood is apparent, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is detectable.
- Major – impact to a site with concentrations of petrified wood is severe or of exceptional benefit, or the impact to a special site (one with dense concentrations or special kinds of petrified wood) is readily apparent.

Health and Safety

- Negligible – the impact to human health and safety would be so small that it would not be of any measurable or perceptible consequence.
- Minor – the impact to human health and safety would be slight and localized, with few measurable consequences.
- Moderate – the result is readily apparent—changes to human health and safety with measurable consequences.
- Major – the result is a severely adverse or exceptionally beneficial effect to human health and safety.

Park Operations

- Negligible – change to park operations would be so small that there would be no measurable or perceptible consequence.
- Minor – change to park operations would be slight and localized, with few measurable consequences.

- Moderate – readily apparent changes to park operations with measurable consequences would result.
- Major – a severely adverse or exceptionally beneficial change in park operations would result.

The *duration* of the impacts in this analysis is defined as follows:

- *Short term* – impacts occur only during construction or last less than one year.
- *Long term* – impacts last longer than one year.

Cumulative Impacts. The CEQ regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and preferred alternative.

Cumulative impacts were determined by combining the impacts of the preferred alternative (replacing or adding waterline segments, valves, hydrants, and sprinklers) with other past, present, or reasonably foreseeable future actions. It was therefore necessary to identify past, ongoing, or reasonably foreseeable future actions in the area of the national park. Petrified Forest National Park is currently revising its 1992 *General Management Plan*. Based on progress on the general management plan revision, the following actions are considered reasonably foreseeable future actions:

- re-roofing of Painted Desert Inn (2002)
- rehabilitation of Painted Desert Inn (2003 – 2004)
- conversion from water-based system to vault toilets for Agate Bridge/Jasper Forest area
- addressing failing septic/leach field systems at Chinde Picnic Area and Painted Desert Inn
- possible conversion of 1930s structures at Agate Bridge and Puerco Pueblo from restroom use to interpretive/shade structures (more in keeping with original use)
- construction of new trails and wayside exhibits
- replacement of sewer system lines at Painted Desert Headquarters and Rainbow Forest
- removal of the Puerco sewage lagoons
- installation of automatic sprinklers and fire/smoke alarms in Painted Desert Headquarters buildings

IMPAIRMENT OF PARK RESOURCES AND VALUES

In addition to determining the environmental consequences of the proposed action and alternatives, the 2001 NPS *Management Policies* (NPS 2001A) and Director's Order–12 require analysis of potential effects to determine if actions would impair park resources. The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must seek ways to avoid, or minimize to the greatest degree practicable, adversely impacting park resources and values. Congress has given NPS

managers discretion, however, to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values.

The prohibited impairment is an impact that would, in the professional judgment of the responsible NPS manager, harm the integrity of park resources or values, including opportunities that would otherwise be present for the enjoyment of those resources or values. An impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is as follows:

- Necessary to fulfill specific park purposes identified in the establishing legislation or proclamation of the park
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park
- Identified as a goal in the park's general management plan or other relevant NPS planning documents

A determination on impairment is made in the "Conclusion" section of most impact topics of this document. Impairment statements are not required for health and safety or park operations topics.

CULTURAL RESOURCES AND SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT

In this EA, impacts to historic structures and districts and archaeological resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the CEQ that implement NEPA. These impact analyses are intended, however, to comply with the requirements of both NEPA and section106 of the NHPA. In accordance with the Advisory Council on Historic Preservation's regulations implementing section106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to historic structures and districts and archaeological resources were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the NRHP; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the NRHP; and (4) considering ways to avoid, minimize or mitigate adverse effects.

Under the Advisory Council's regulations a determination of either *adverse effect* or *no adverse effect* must also be made for affected NRHP eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualify it for inclusion in the NRHP, e.g. diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the preferred alternative that would occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). A determination of *no adverse effect* means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the NRHP.

CEQ regulations and the NPS *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order–12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g., reducing the intensity of an impact from major to moderate or minor. Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by section106 is similarly reduced. Although adverse effects under section106 may be mitigated, the effect remains adverse.

A section106 summary is included in the impact analysis sections for historic structures and landscapes and archaeological resources under the preferred alternative. The section106 summary is intended to meet the requirements of section106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criteria of effect and criteria of adverse effect found in the Advisory Council's regulations.

ENVIRONMENTAL CONSEQUENCES-—ALTERNATIVE A: NO-ACTION

Rainbow Forest Historic Landscape

The lack of a fire suppression system, under the no-action alternative, could result in damage or total loss of the buildings at Rainbow Forest in the event of a fire. This constitutes a potential long-term, minor to moderate, adverse impact to historic structures and the landscape.

CCC Pipeline

As sections of pipes break, they are replaced with new pipe sections. Valves are replaced when the operational budget allows. Current management activities include the replacement of line segments as leaks occur and replacement of valves as they break. These repairs are implemented within the existing pipeline alignment and do not affect the pipeline's setting, location, or use. The 36 CFR section 800.9, *Criteria of effect and adverse effect*, subsection (c)(2) states effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse for the purposes of regulations when the rehabilitation of structures is conducted in a manner that preserves the historical values through conformance with the Secretary's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. The intent of the Standards is to assist the long-term preservation of a property's significance through the preservation of historic materials and features. As stated in the definition, the treatment "rehabilitation" assumes that at least some repair or alteration of the historic building will be needed in order to provide for an efficient contemporary use. Therefore the no-action alternative has effect, but no adverse effect on the pipeline.
Cumulative Impacts. Alternative A would not contribute to cumulative effects on historic structures and districts located within the project area.

Past, present, and reasonably foreseeable future modifications to the structures at Rainbow Forest, and proposed projects for additional parking and circulation modifications, have combined to result in minor to moderate, adverse impacts. Restoration of structures would have

a long-term, minor, beneficial effect. Future projects that might directly or indirectly alter characteristic historic districts would be addressed through further consultation with the Arizona SHPO and additional NEPA compliance, as necessary.

A 1.5-mile segment of the pipeline has already been replaced with PVC pipe. Valves have degraded to the point of malfunction. Cumulative effects from past and future pipeline maintenance activities could eventually lead to long-term, minor to moderate, adverse impacts to the pipeline.

Conclusion. There would be no new impacts to historic landscape or Rainbow Forest structures under the no-action alternative. There would be no adverse impact to the pipeline. The cumulative effect of the no-action alternative on historic structures and the landscape, combined with other past, present, and reasonably foreseeable future actions, would be long-term, minor to moderate, adverse impacts, and long-term, minor, beneficial impacts.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Archaeological Resources

The possibility for disturbance of and damage to archaeological resources near the pipeline exists whenever there is a break in the line. Sensitive areas may be flooded and resources altered. The waterline corridor is previously disturbed and there are 11 known archaeological sites within 100 feet of the pipeline, so the potential impact is long term, adverse, and minor.

Cumulative Impacts. Alternative A would not contribute to cumulative effects on archaeological resources located within the project area.

A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect archaeological resources in the park. Development, park maintenance, vandalism, theft, visitor use, and natural processes all pose a potential threat to resources. Past development has resulted in disturbance to, and loss of, some archaeological resources. Vandalism of sites and theft of resources has occurred in the past, both within and outside park boundaries. Resources have been directly and indirectly damaged through visitor use and natural processes, a minor, long-term, adverse impact on archaeological resources.

Conclusion. Potential impacts associated with flooding caused by breaks in the waterline are long term, adverse and minor. Cumulative effects would also be long term, adverse, and minor.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Museum Collections

Without adequate fire suppression, the museum collections exhibited at the Rainbow Forest Museum are susceptible to damage or destruction in the event of a fire. The collection exhibited at Rainbow Forest Museum is a small portion of the total collection housed at the park or other research facilities. The resulting potential impact would be long term and moderate under the no-action alternative.

Cumulative Impacts. No past, ongoing, or reasonably foreseeable future actions by others would be expected to combine with these actions to result in a cumulative impact on the museum collections under alternative A.

Conclusion. Current potential impacts to the museum collections, under the no-action alternative, are adverse, long term, and moderate. No cumulative impacts to museum collections would be expected.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Biotic Communities, Including Threatened and Endangered Species

There would be no new impacts to biotic communities (vegetation, wildlife, and threatened, endangered, or sensitive species) should the no-action alternative be implemented.

Cumulative Impacts. The no-action alternative is not expected to contribute to cumulative effects on biotic communities along the existing pipeline corridor.

A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect biotic communities at Petrified Forest National Park. Livestock grazing, which occurred until 1962 in the park, resulted in fragmented shortgrass prairie remnants. Human activities such as construction and maintenance of buildings, roads, and visitor facilities have resulted in localized disturbance of biotic communities. Examples at Petrified Forest National Park include the project to replace the Jim Camp Wash bridge and potential future sewer line replacements. The no-action alternative would have short-term, local, and minor adverse cumulative impacts to vegetation and wildlife.

Conclusion. There would be no new impacts resulting from the no-action alternative. The cumulative effect of the no-action alternative would be short-term, local, and minor adverse impacts to vegetation and wildlife.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key

to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Petrified Wood and Other Fossils

The possibility for disturbance of and damage to petrified wood and other fossils near the pipeline exists whenever there is a break in the line. Sensitive areas may be flooded and resources altered. The waterline corridor is previously disturbed, so the potential impact is long term, adverse, and negligible to minor.

Cumulative Impacts. Alternative A would not contribute to cumulative effects on petrified wood and other fossils located within the project area.

A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect petrified wood and other fossils in the park. Development, park maintenance, vandalism, theft, visitor use, and natural processes all pose a potential threat to resources. Past development, theft, and displacement have contributed to the loss of petrified wood and other fossils resources throughout the park and to the loss of scientific knowledge that these resources in context might have yielded. Combined with other past, present, and reasonably foreseeable future actions, the no-action alternative would have a negligible to minor long-term, adverse impact to petrified wood and other fossils.

Conclusion. Potential impacts associated with flooding, caused by breaks in the waterline, would be long term, adverse and negligible to minor. Cumulative effects would also be long term, adverse, and negligible to minor.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Health and Safety

NPS *Director's Order–83, Public Health*, directs that park managers reduce the risk of waterborne diseases and provide safe drinking water to employees, the visiting public, and park partners by assuring that drinking water systems are properly operated, maintained, and monitored, and deficiencies are promptly corrected. There is generally little risk of water contamination due to leaky pipes because positive water pressure prevents contaminants from entering the waterline. There is contamination risk when damaged or leaky sections are drained and repaired, however. Repairs to existing water transmission and distribution systems are necessary approximately every few months. Park crews flush the line after waterline repairs to reduce the risk of contamination. In the no-action alternative the risk of water contamination would remain relatively low, a long-term, minor, adverse impact on human health.

Excavating trenches is necessary whenever buried utilities, including waterlines, are constructed or repaired. Accident statistics compiled by the Occupational Safety and Health Administration (OSHA) show that trenching and excavation are among the most dangerous activities in the construction industry; each year 100 to 400 people are killed and another 1,000 to 4,000 injured in trenching and shoring mishaps (OSHA 2002b). There have been no "lost-time" accidents at the park related to waterline repairs thus far. Provided OSHA standards for excavating and trenching are followed during waterline repair activities, the risk of an accident would remain low, constituting a long-term, minor, adverse impact on human safety.

Working with asbestos-cement pipe is considered hazardous because carcinogenic asbestos particles can be released when the pipe is cut or disturbed. Personal protective equipment, such as respirators and body coverings, must be used when working with asbestos-cement pipe (OSHA 2002a). Assuming that OSHA standards for working with asbestos are followed during waterline repair activities, risk from asbestos would remain low, a long-term, minor, adverse impact to human health.

Fire safety is not optimal at Rainbow Forest for at least three reasons: low water delivery capacity of the 4-inch diameter waterline, erratic water pressure, and lack of automatic fire suppression sprinklers in the museum and residential units. Under such conditions, a structural fire could quickly become perilous, presenting a grave risk to human safety and life. This danger represents a moderate, long-term, adverse impact to human safety at the park.

Cumulative Impacts. Past and reasonably foreseeable future actions improving health and safety at the park include installation of automatic sprinklers and alarm systems at Painted Desert Inn and Painted Desert Headquarters. The cumulative effect of the no-action alternative, combined with other reasonably foreseeable projects, would be long term, beneficial, and minor in intensity.

Conclusion. The no-action alternative would have minor to moderate adverse impacts on human health and safety from water contamination risk, construction hazards, and fire danger. Cumulative impacts from improved fire safety would be long term, beneficial, and minor in intensity.

Park Operations

Impacts to park operations would be adverse, long term, and minor to moderate, depending on the incidence of future waterline problems. With the existing water distribution system, it takes one to two days, on average, to find a leak in the south waterline. Up to seven maintenance workers are required to find a leak, and three or four workers are needed to repair a leak. Waterline valves sometimes seize open or closed as well. Working with asbestos-cement pipe is cumbersome because workers must wear special equipment to protect themselves from the asbestos hazard. When a waterline breaks or a valve freezes at the Painted Desert Headquarters Complex, water delivery to the entire complex, including visitor restrooms and concessions facilities, must be shut off. Water lost from waterline breaks results in substantial costs to the park for water, equipment and materials, and labor.

Cumulative Impacts. Current or reasonably foreseeable future actions at Petrified Forest National Park (e.g., the Jim Camp Wash bridge replacement and parking improvements at Rainbow Forest, sewage system improvements, and constructing new trails) could result in short term, minor increases in the workload of some park staff due to increased needs for project coordination, and resource protection and monitoring during construction. The cumulative effect of the no-action alternative, combined with other reasonably foreseeable construction projects, would be short-term, adverse, and of minor intensity.

Conclusion. Impacts to park operations would be adverse, long term, and minor to moderate in intensity, depending on the incidence of future waterline breaks and valve problems. The cumulative effect of the no-action alternative, combined with other reasonably foreseeable construction projects, would be short-term, adverse, and of minor intensity.

ENVIRONMENTAL CONSEQUENCES—ALTERNATIVE B: PREFERRED ALTERNATIVE

Historic Structures and Landscape

The preferred alternative includes installation of a fire suppression sprinkler system inside the museum and residences of the Rainbow Forest Historic Landscape. The 36 CFR section 800.9, *Criteria of Effect and Adverse Effect*, subsection (c)(2) states effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse for the purposes of regulations when the rehabilitation of a structure is conducted in a manner that preserves the historical values through conformance with the Secretary's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. The intent of the Standards is to assist the long-term preservation of a property's significance through the preservation of historic materials and features. As stated in the definition, the treatment "rehabilitation" assumes that at least some repair or alteration of the historic building will be needed in order to provide for an efficient contemporary use. The Standard recommends that mechanical systems should not be concealed in walls or ceilings in a manner that requires the removal of historic building material. The route pipes would be installed in concealed spaces (drop ceilings added in more recent years) where possible (building 50, 51 group, 52 group, and 53) and exposed in some structures and units (museum and basements). The fire suppression system would afford the buildings better protection and would have a long-term, beneficial, minor impact on the structures at Rainbow Forest. The new mechanical systems would have an effect but no adverse effect on the structures at Rainbow Forest. The fire suppression system would have no effect or impact on the Rainbow Forest Cultural Landscape.

The pipeline is a contributing element of the Rainbow Forest Historic Landscape. The proposed action calls for the existing CCC-built pipeline to be abandoned in place in the developed area and, to the greatest extent possible, from the developed area to the 50,000-gallon or CCC-built reservoir. The reservoir would not be affected. Therefore the proposed action would not have an adverse effect on the pipeline or the historic landscape. The installation of new pipeline would not alter the topography, vegetation, circulation features, spatial organization, or land-use patterns of the landscape once construction is complete. In addition, any visual, audible, and atmospheric intrusions associated with construction would be temporary, adverse, and

negligible, lasting only as long as construction. Because the integrity of the potential landscape would be unaffected, there would be no long-term, adverse impact to the historic landscape.

CCC Pipeline

Along the south waterline, the proposed rehabilitation project would allow the pipeline to function for an additional 35 years as projected in the 1986 engineering evaluation. The original design intent, location, setting, and physical characteristics would be retained. The intent of the Secretary's Standards is to assist the long-term preservation of a property's significance through the preservation of historic materials and features. As stated in the definition, "rehabilitation" assumes that at least some repair or alteration of the historic structure will be needed in order to provide for an efficient contemporary use. Replacement of valves and appurtenances would constitute an effect on the waterline; however, a majority of the pipeline would be rehabilitated and the location, use, and setting of the waterline would not be altered; therefore, this would not be an adverse effect under section 106. The impact to the waterline would be minor, adverse, and long term.

Cumulative Impacts. Past and present modifications to the structures at Rainbow Forest and proposed projects for additional parking and circulation modifications have combined to result in minor to moderate, adverse impacts to the landscape, while the planned rehabilitation of structures would have a long-term, minor, beneficial effect to the historic structures. The installation of the new water distribution system in the developed area would have a negligible contribution to cumulative impacts to the landscape. The installation of the sprinkler system would have an adverse and negligible cumulative effect on loss of integrity of the structures.

A 1.25-mile section of the pipeline north of Mountain Lion Mesa was replaced with PVC pipe in the summer of 1998. This replacement, combined with the removal of some pipeline from the Rainbow Forest reservoir to Rainbow Forest developed area (preferred alternative), constitutes a cumulative impact to the pipeline, but not to the alignment or distribution system. Other reasonably foreseeable future actions may include the abandonment of the lines to Agate Bridge and Puerco Pueblo. The result would be a long-term, minor, adverse cumulative impact on the pipeline under alternative B.

Section 106 Summary. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5) the National Park Service determined there would be no adverse effect to the structures at Rainbow Forest Historic Landscape. The overall characteristics and integrity of the landscape would be retained.

After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5) the National Park Service determined that the activities proposed in alternative B would have no adverse effect to the CCC pipeline because the overall historic integrity would be retained.

Conclusion. Alternative B would have a long-term, beneficial, minor impact on the structures at Rainbow Forest, and impacts to the landscape would be short term, adverse, and negligible. Alternative B would have a minor, long-term, adverse effect on the CCC pipeline. The preferred alternative would have both minor to moderate, long-term, cumulative, adverse

impacts, and long-term, minor, beneficial, cumulative impacts to historic structures and the landscape.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Archaeological Resources

The activities proposed in alternative B have the potential to affect archaeological resources, even though such resources would be avoided to the maximum possible extent. There would be ground disturbance in all segments of the project. Work prescribed for the waterline between Puerco and the Rainbow Forest reservoir has the greatest potential to affect sensitive archaeological resources. Placement of appurtenances would be modified to avoid sensitive resources and areas. Park cultural resource staff and project design staff conducted a site reconnaissance in April 2002 to determine which, if any, archaeological sites might be affected by the proposed action. Thirty archaeological sites were investigated. Eight sites were determined to be in the proximity of the proposed action, but there would be no impact to six of these sites. Two additional sites could potentially be impacted by the preferred alternative (see discussion below).

One site is a CCC-era camp with prominent features, including CCC-era rock art and historic culverts created for the waterline. One proposed vault is near one of these culverts. It was recommended that the vault be repositioned several meters to the southwest to negate the potential impact. It was also recommended that heavy vehicle and foot traffic could impact this area and thus should be kept to a minimum.

The second site includes prehistoric masonry rooms and associated lithic scatter. The waterline runs directly through this site and several of its features, including a pit house. A pre-existing vault appears to be situated in the midst of the pithouse feature of this site. Replacement of the valve (which is within a vault) is advisable; neglect of the vault could result in a waterline break here, which would have a major impact on the site. No further excavation is needed at the valve location. The features are in an unconsolidated sand dune located above road level, and it appears that the waterline itself is just above road level as well. A break at this point would wash large amounts of the unconsolidated dune and the associated site into the roadway. The major threat to the site from the proposed action would be foot traffic, but damage would be minimized by restricting foot and vehicle traffic in the area. The impact would be short-term, negligible to minor, and adverse.

If significant archaeological resources are discovered on the pipeline easement (private property) during the upcoming survey, adjustments would be made in the proposed project to avoid or minimize impacts to these resources.

Approximately 3,300 feet of waterline between Rainbow Forest reservoir and Rainbow developed area would be replaced in the existing trench. The area is not particularly rich in

archaeological resources, but there is still potential to affect archaeological resources, especially unknown resources. The potential impact would be adverse, short-term, and minor. Waterline improvements should reduce the frequency of waterline breaks and enable crews to locate and repair breaks more efficiently. This would reduce potential impacts to archaeological resources from flooding, a long-term, minor to moderate, beneficial impact.

Cumulative Impacts. A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect archaeological resources in the park. Development, park maintenance, vandalism, theft, traditional visitor use, and natural processes pose a threat to resources. Past development has resulted in disturbance to, and loss of, some archaeological resources. Vandalism of sites and theft of resources has occurred in the past, both within and outside park boundaries. In combination with other impacts, the preferred alternative would have a cumulative minor, long-term, adverse impact on archaeological resources.

Section 106 Summary. The potential level of adverse effect associated with the preferred alternative would be minimized or avoided through the use of archaeological monitors at particularly sensitive sites, placement of appurtenances to avoid sensitive resources and areas, and implementation of other mitigating measures, as necessary. All mitigation would be implemented in consultation with the Arizona SHPO and Native American Tribes, as appropriate. After applying the Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR 800.5) the National Park Service determined there would be an no adverse effect on archaeological resources in the project area.

Conclusion. The ground disturbing activities associated with alternative B would have short-term, negligible to minor, adverse impacts on archaeological resources by avoiding known resources when possible and restricting traffic when necessary. Fewer waterline breaks, better leak detection, and faster repairs would have long-term, minor to moderate benefits to archaeological resources. Cumulative effects would be long term, minor, and adverse.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Museum Collections

The preferred alternative includes installation of fire suppression sprinklers in the Rainbow Forest Museum. This would provide better fire protection for items exhibited in the museum, and the museum would come closer to meeting NPS standards for curation. The impact would be long term, beneficial, and minor.

Cumulative Impacts. No past, ongoing, or reasonably foreseeable future actions would be expected to combine with these actions to result in cumulative impacts on museum collections under alternative B.

Conclusion. Alternative B would have a minor, long-term, beneficial impact on museum collections. There would be no cumulative impacts on museum collections.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Biotic Communities, Including Threatened and Endangered Species

Aspects of this project with potential to impact biotic communities include: 1) replacing or installing appurtenances (isolation valves, air relief valves, and drain valves) between the Rainbow Forest reservoir and Puerco; 2) replacing the water pipeline between the in-use Rainbow Forest reservoir on the mesa top and the Rainbow Forest developed area; and 3) installing a new water distribution system in the Rainbow Forest developed area.

Replacing and/or installing appurtenances along the existing pipeline between Rainbow Forest reservoir and Puerco would require excavations of 4- to 5-feet deep, 8- to 10-feet long, and a maximum of 4-feet wide. These excavations would be dug by a backhoe with a 2-foot wide bucket at each valve location (roughly 40 along the existing pipe, and 5 new valves).

Replacing the waterline between the Rainbow Forest reservoir and the Rainbow Forest developed area would require re-opening the CCC-dug trench. Trenches would be dug with a trenching machine on all but the steepest slopes (i.e., the sides of the mesa, just below the Rainbow Forest reservoir), where trenches would be hand dug instead. Work on the water distribution system at Rainbow Forest developed area would occur mostly in already disturbed, developed areas. However, some disturbance would be expected in the natural areas surrounding the developed portion of Rainbow Forest.

Excavations, trenching, and hand digging would require clearing of vegetation. Vegetation would also be directly affected by compaction from construction equipment, stored materials, human trampling, or temporarily displaced soils. Indirect effects on vegetation would result from soil compaction. Plant seedlings tend not to penetrate compacted soil and usually die before becoming established. In addition, water and air pass more slowly through compacted soils, thus increasing seedling mortality.

Several measures would be taken to mitigate the direct and indirect impacts noted, however. These include selective positioning for equipment staging and material storage, defining construction zones, and returning topsoil to disturbed areas when the project is completed (refer to "Mitigation Measures for the Preferred Alternative" in the Alternatives chapters for a detailed discussion of steps that would be taken). As a result of implementing this alternative and the mitigation measures discussed, short-term (duration of the project and until vegetation is reestablished), minor, adverse impacts on vegetation would be expected.

During construction, some wildlife would be temporarily disturbed or displaced, including some small animals (e.g., mice, reptiles, and amphibians) that may be killed or forced to

relocate outside the project area. This displacement may reduce populations slightly during construction, but once the project was completed and mitigation measures employed, wildlife would be expected to reoccupy the area. Larger species (e.g., coyote, pronghorn) would probably avoid the project site during the construction phase altogether. Therefore, implementing this alternative is expected to have short-term (duration of the project and habitat restoration), minor, adverse impacts on wildlife.

Vegetation clearing and compaction, and soil compaction associated with construction, may affect potential gladiator milk vetch (a species of special concern) habitat. This is very unlikely, however, because potentially suitable habitat only occurs in one place, and to a very limited extent, near the existing pipeline. The potential habitat is also located along the stretch of the existing pipeline that will be subject only to localized disturbance associated with replacing and installing appurtenances. Therefore, with appropriate mitigation measures (e.g., avoiding the potentially suitable gladiator milk vetch habitat altogether, using hand digging if a valve must be replaced or installed in or near this area, or transplanting individual plants to another suitable location) implementing this alternative should result in no adverse impacts to threatened, endangered, or special concern species, or to their habitat.

After the new waterline segments are installed, the lines would be disinfected and flushed with chlorinated water. The contractor would capture the flushed chlorianted water in a tanker truck and haul the water offsite for disposal, or add a neutralizer such as sodium bisulfite, before discharging the water into a wash. This would result in no adverse impacts to biotic communities, threatened, endangered, or special concern species, or to their habitat.

Cumulative Impacts. A variety of past, present, and reasonably foreseeable actions have affected and will continue to affect natural resources at Petrified Forest National Park. Livestock grazing, which occurred in the park until 1962, resulted in fragmented shortgrass prairie remnants. In addition, human activities, such as construction and maintenance of buildings, roads, and visitor facilities, have locally disturbed biotic communities and have the potential to do so in the future. Examples at Petrified Forest National Park include the project to replace the Jim Camp Wash bridge and the potential sewer line replacement. The result would be short-term, local, and minor, cumulative, adverse impacts to vegetation and wildlife.

The preferred alternative would have short-term, negligible, adverse cumulative impacts on vegetation and wildlife, and no cumulative impacts on threatened and endangered species or their habitat.

Conclusion. This alternative is expected to have localized, short-term, minor adverse impacts on biotic communities at the park. Cumulative adverse impacts would result for vegetation and wildlife, but these are expected to be short-term and negligible.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Petrified Wood and Other Fossils

A survey of petrified wood and other fossil resources along the entire waterline corridor was completed in 2002. With a few exceptions, the waterline avoids paleontological resources. The ground at Painted Desert Headquarters where new hydrants and valves are proposed was previously disturbed by development. Along the south waterline, the project design team would propose tentative locations for new valves, then work with park resource staff to adjust proposed valve locations to avoid sensitive paleontologic areas.

There is potential for petrified wood disturbance at and near Rainbow Forest. Impacts would be minimized by placing new pipeline in the existing trench and by working in already disturbed areas, but some disturbance of petrified wood by vehicles, construction equipment, and foot traffic would be unavoidable. When disturbing petrified wood is unavoidable, a photograph of the petrified wood would be taken for the record, the location would be noted by means of a global positioning system, and the specimens would be moved to the side and left there. There is also potential for petrified wood theft by waterline construction workers, but this is not a major concern due to the relative scarcity of resources within the waterline corridor. Even so, construction workers would receive orientation information about petrified wood and other fossil resources to minimize inadvertent or intentional damage to these resources.

The impact of the preferred alternative on petrified wood and other fossils is projected to be long term, adverse, and minor in intensity.

Cumulative Impacts. Past development and theft have contributed to the loss of petrified wood and other fossils throughout Petrified Forest National Park. Reasonably foreseeable future actions, such as constructing new trails, pullouts, wayside exhibits, and comfort stations, have the potential to disturb unknown deposits, but future development would be located so as to minimize impacts to the park's known petrified wood and fossil sites. Loss of petrified wood from theft and/or displacement has been estimated at 10- to12-tons per year, and the loss continues despite the park's strong interpretive and resource protection emphasis on leaving this nonrenewable resource on the ground.

The preferred alternative has potential to contribute long-term, minor adverse impacts to petrified wood and other fossil resources. The cumulative effect of the preferred alternative on the park's petrified wood and other fossil resources, in combination with other past, present, and reasonably foreseeable future actions, would be long-term, adverse, and minor in intensity.

Conclusion. The impact of the preferred alternative on petrified wood and other fossils is projected to be long term, adverse, and minor in intensity. The cumulative effect of the no-action alternative on the park's petrified wood and other fossils, in combination with other past, present, and reasonably foreseeable future actions, would be long term, adverse, and of minor intensity.

Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the park's establishing legislation, 2) key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents, there would be no impairment of park resources or values.

Health and Safety

Asbestos-cement pipe is hazardous if particles are released into the air when the pipe is physically disturbed or cut, so safety equipment such as respirators must be used. The safest procedure is to leave the old pipe in place whenever possible.

Under this alternative, the existing pipeline would remain in use for most of the waterline. Air relief, isolation, and drain valves would be replaced at 25 to 30 locations along the south waterline. Excavations would be required to replace the valves. In addition, pressure gauges would be installed at 15 locations to help locate leaks. To minimize surge pressures and gasket failure, the park would closely regulate the rate of valve opening and closing. In the event of a leak, the park would contract for professional leak-detection services. Past waterline leaks have consistently occurred near pipe joints. After a leak is located, the park would repair the leak using custom Dresser repair couplings, without cutting or removing leaky segments of old pipe

Between the Rainbow Forest reservoir and the Rainbow Forest developed area, new pipe would be placed in the existing trench. The old asbestos-cement pipe would be left in the trench or, if necessary, removed by trained professionals and disposed of according to hazardous material disposal requirements for asbestos. As much as 3,300 feet of asbestos-cement pipe could require removal. Health risks from working with and removing asbestos-cement pipe would be negligible to minor, provided that OSHA standards are followed during removal and repair activities.

Installation of new and additional valves (south waterline and Painted Desert Headquarters) and new waterlines (Rainbow Forest area) would mean fewer leaks in the park's water delivery system overall. Fewer leaks would reduce the risk of contamination to the park's water supply, as contamination is possible whenever a damaged or leaky waterline is drained and repaired. As in the no-action alternative, crews would flush the line after repairs to minimize the risk of contamination. Fewer leaks would mean reduced exposure to excavating and trenching hazards for park maintenance crews. Although OSHA construction standards would be followed during waterline repair activities, there would still be some risk. Reduced risks from water contamination and construction hazards would have minor, long-term, beneficial impacts on human health and safety.

The preferred alternative also includes a higher capacity waterline from the Rainbow Forest reservoir, plus new valves, hydrants, and distribution lines at Rainbow Forest. Automatic sprinklers would be installed in the Rainbow Forest Museum and residential units. Automatic fire suppression and fire-fighting capability at Rainbow Forest would improve substantially as a result, reducing fire danger to visitors, staff, and residents. The result would be a long-term, minor, beneficial impact on human safety.

Cumulative Impacts. Past and reasonably foreseeable future actions improving health and safety at the park include installation of automatic sprinklers, emergency exits, and alarm systems at Painted Desert Inn and Painted Desert Headquarters. The cumulative effect of the preferred alternative, combined with other reasonably foreseeable projects, would be long-term, beneficial, and moderate in intensity.

Conclusion. Impacts from exposure to asbestos would be short term, adverse, and negligible to minor. The preferred alternative would have long-term, minor, beneficial impacts on human health and safety due to reduced water contamination and construction hazards and to improved fire safety at Rainbow Forest. Cumulative impacts from improved fire safety would be long term, beneficial, and moderate in intensity.

Park Operations

Visitors, park staff, residents, and the park concessionaire may be temporarily inconvenienced during changeover and testing of new waterline components, especially at Painted Desert Headquarters. The 200,000-gallon water reservoir above Rainbow Forest would be refilled periodically during construction to minimize water service interruptions at Rainbow Forest. Also, construction work would be scheduled, as feasible, to minimize impacts on visitors, residents, and others. Water service interruptions due to construction would have a short term, minor, adverse impact on operations.

Once construction is complete, breaks should be less frequent, leaks easier to detect and find, and leaky sections easier to isolate. The park would hire a professional leak detection service to locate a leak when gauges indicate loss of water or pressure. The cost of this service, which could be fairly expensive, would be borne by the park's operating budget, and would come at the expense of other programs. Crews would need to exercise new valves every six months or so to keep them from seizing.

Future breaks in the south waterline would be repaired with custom Dresser repair couplings, which do not require cutting or removal of asbestos-cement pipe sections. Personal protective gear for working with asbestos would not be required for most repairs, making repairs less cumbersome. New valves and hydrants at Painted Desert Headquarters would allow crews to service or repair waterline components without interrupting water service to the entire complex. Water supply costs would fall because less water would be lost from leaky waterlines.

Over the long-term, waterline improvements would have a moderate, beneficial impact on operations.

Cumulative Impacts. Current or reasonably foreseeable future actions at Petrified Forest National Park (e.g., the Jim Camp Wash bridge replacement, parking improvements at Rainbow Forest, sewage system improvements, and new trail construction) could result in short-term, minor increases in the workload of some park staff. These increases would result from work related to project coordination, plus resource protection and monitoring during construction. Some of these projects could occur at the same time as the waterline improvements. The cumulative effect of the preferred alternative, combined with other reasonably foreseeable construction projects, would be short term and long term, adverse, and minor in intensity.

Conclusion. There would be some short-term, minor, adverse impacts to park operations from construction, but long-term impacts to park operations would be moderate and beneficial. Cumulative impacts would be short term and long term, adverse, and minor in intensity.

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- Executive Order 13045, Protection of Children from Environmental Health and Safety Risks
- Executive Order 12898, Environmental Justice

NATIONAL PARK SERVICE ORDERS AND GUIDANCE

- Director's Order–2, *Planning Guidelines*
- Director's Order –12, *Conservation Planning, Environmental Impact Analysis and Decision-making*
- Director's Order–24, *NPS Museum Collections Management*
- Director's Order –28, *Cultural Resource Management Guideline*
- Director's Order–47, *Sound Preservation and Noise Management*

- Director's Order – 77, *Natural Resource Management Guideline*
- Director's Order–83, *Public Health*
- 2001 Management Policies

CONSULTATION AND COORDINATION

Agencies and organizations contacted for information; or that assisted in identifying important issues, developing alternatives, or that will be given an opportunity to review and comment on this environmental assessment include the following:

FEDERAL AGENCIES

Advisory Council on Historic Preservation
Office of Navajo and Hopi Indian Relocation
U.S. Army Corps of Engineers
U.S. Department of Agriculture – Natural Resources Conservation Service
U.S. Fish and Wildlife Service
U.S. Geological Survey

TRIBES

Dilkon Chapter of the Navajo
Hopi Tribe
Indian Wells Chapter of the Navajo
Klagetoh Chapter of the Navajo
Lower Greasewood Chapter of the Navajo
Nahatadzill Chapter of the Navajo
Navajo Nation
Pueblo of Zuni
Wide Ruins Community Chapter of the Navajo
White Mountain Apache Tribe

STATE AND LOCAL AGENCIES

Apache County Board of Supervisors
Arizona Department of Environmental Quality
Arizona Game and Fish Department
Arizona State Parks – State Historic Preservation Office
City of Holbrook
Navajo County Board of Supervisors

OTHER ORGANIZATIONS

AMFAC Parks and Resorts
Grand Canyon Trust
Little Colorado River Plateau R.C.&D
National Parks and Conservation Association
White Mountain Audubon Society

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PREPARERS

This environmental assessment was prepared by engineering-environmental Management, Inc. under the direction of Ms. Michele Hellickson, Superintendent, Petrified Forest National Park. Ms. Hellickson and Petrified Forest National Park staff (especially Karen Beppler-Dorn, Pat Thompson, Bill Grether, and Chad Thomas) provided invaluable assistance in the development and technical review of this environmental assessment. The individuals who prepared this document are listed below:

Jayne Aaron, Environmental Planner
M.A. Environmental Policy and Management
B.A. Environmental Design
Years of Experience: 11

Chris Baker, Cultural Resources Specialist
M.A. History and Public History
B.A. History
Years of Experience: 4

Wanda Gray, Technical Publications Specialist
Years of Experience: 25

Dan Niosi, Natural Resources Specialist/Planner
B.A. Environmental Studies – Natural Resources
Years of Experience: 2

Miki Stuebe, Landscape Architect/Planner
M.L.A. Landscape Architecture
M.S. Biology-Ecology
B.A. Biology
Years of Experience: 13

Jim Von Loh, Senior Biologist
M.S. Biology
B.S. Biology
Years of Experience: 25

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APPENDIX 1

NATIONAL PARK SERVICE PRESS RELEASE

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National Park Service
U.S. Department of the Interior

Petrified Forest National Park

P.O. Box 2217
1 Park Road
Petrified Forest, AZ
86028

(928)524-6228 phone
(928)524-3567 fax

Petrified Forest N.P. News Release

February 21, 2002
For Immediate Release
Karen Beppler (928)524-6228 Ext 263

PUBLIC COMMENTS ARE SOUGHT ON PROPOSED PARK WATERLINE REHABILITATION

Petrified Forest National Park officials today announced they are proposing to rehabilitate 13 miles of waterline from the Puerco River to the Rainbow Forest area within the park. This project also includes replacement of portions of 12 miles of distribution lines, which serve the visitor center areas and restroom facilities along the main park road. Installation of fire suppression systems in structures at Rainbow Forest may also be included in the project. Rehabilitation of the waterline should alleviate the numerous pipe breakage problems the park has experienced in the last several years and allow the early detection of leaks along the line.

The Civilian Conservation Corps (CCC) constructed the original section of water line between Puerco River and Rainbow Forest during 1938 and 1939. It is considered the longest facility of this type installed by the CCC in a unit of the National Park System. The water line is potentially eligible for listing on the National Register of Historic Places.

Funding was requested for a complete replacement of the main water line between the Puerco River and Rainbow Forest to minimize water leaks, decrease the time park staff spends on repairs, reduce potential risks to public and employee health and safety, and to provide reliable fire suppression capabilities. However, due to the historical significance of the waterline and potential impacts associated with new construction, the NPS has identified an alternative to replacement of the line. The alternative will add a leak detection system and replace valves along the pipeline. This alternative will meet the goals of the project while preserving most of the historic components of the pipeline.

An early step in the National Park Service planning process is to involve the public. In May 2001 the public was invited to provide input on this project. Since the scope of the project has since been changed from replacement of the main waterline to rehabilitation of the main waterline, park managers are again soliciting comments on the concerns and issues to be addressed in an environmental assessment (EA) that is being prepared for this project. The EA should be available for public review in the spring of 2002.

To assist Petrified Forest National Park with the Water Line Project, the public is invited to comment on the proposal and any related issues or concerns they may have. Please write to the Superintendent, Attention: Water Line Project, Petrified Forest National Park, P.O. Box 2217, Petrified Forest, Arizona 86028. Comments via email may be addressed to pefo_superintendent@nps.gov. In the subject line, commenters should note that these comments are for the Water Line Project. Any written comments or concerns should be sent to the park by March 8, 2002.

Conceco Engineering, Inc. completed a technical report evaluating the existing water lines at Petrified Forest National Park in 1986. At that time, the water line sections south of the Puerco River, consisting of asbestos cement pipe, were determined to have a life expectancy of 50 years. Since then, the park has experienced a significant amount of breakage along this section of water line resulting in this proposal to rehabilitate it. Rehabilitation of the main water line between the Puerco River and Rainbow Forest is needed to minimize water leaks, reduce the time park staff spends on repairs, and minimize potential risks to public health and safety. Significant costs from water loss are incurred whenever the line breaks. The park currently purchases every gallon of water used in its facilities. These breaks present a risk to public and employee health and safety due to the potential for contamination of the water carried within the line. Park employee safety is also at risk whenever the pipe breaks due to the hazards resulting from working in open trenches.

NPS

EXPERIENCE YOUR AMERICA

The National Park Service cares for special places saved by the American people so that all may experience our heritage.

APPENDIX 2

COORDINATION WITH TRIBES AND AGENCIES

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United States Department of the Interior

NATIONAL PARK SERVICE
P.O. Box 2217
Petrified Forest National Park, AZ 86028

IN REPLY REFER TO:

L7617

<< Date>>

<<Name>>
<<Organization, Agency, Tribe>>
<<Address>>
<<Address>>

<<To whom it may concern,>>

The National Park Service at Petrified Forest National Park is seeking comments regarding a proposed project involving the rehabilitation of 13 miles of waterline from the Puerco River to the Rainbow Forest area within the park. This project also includes replacement of portions of approximately 12 miles of water distribution lines, which serve the visitor center areas and restroom facilities along the main park road, and park concession, administrative and housing facilities. In addition, the project may include the installation of fire suppression systems in certain structures at Rainbow Forest. The goal of this project is to provide a reliable, safe source of water to the Rainbow Forest developed area and to other areas of the park and to enhance the fire suppression capabilities in order to protect both lives and historic structures. This letter is being sent to you due to your past interest in park projects, operations and activities.

Funding was originally requested for a complete replacement of the main water line between the Puerco River and Rainbow Forest to minimize water leaks, decrease the time park staff spends on repairs, reduce potential risks to public health and safety, and provide a reliable water source for fire suppression. However, due to the historical significance of the waterline and potential impacts associated with new construction, the NPS has identified an alternative to replacement of the main waterline. The alternative would add a leak detection system and replace valves along the pipeline. This alternative will meet the goals of the project while preserving most of the historic components of the pipeline.

The Civilian Conservation Corps (CCC) constructed the section of water line between Puerco River and Rainbow Forest during 1938 and 1939. It is considered the longest facility of this type installed by the CCC in an area of the National Park System. The water line is potentially eligible for listing on the National Register of Historic Places. A section of it is a contributing structure in the Rainbow Forest Historic Landscape, which has been determined to be eligible for the National Register.

Conceco Engineering, Inc. completed a technical report evaluating the existing water lines at Petrified Forest National Park in 1986. At that time, the water line sections south of the Puerco River, consisting of asbestos cement pipe, were determined to have a life expectancy of 50 years. Since then, the park has experienced numerous breaks along this portion of water line resulting in this proposal to rehabilitate it. Significant costs from water loss are incurred whenever the line breaks. The park currently purchases every gallon of water used in its facilities. These breaks present a risk to public health and safety due to the potential for contamination of the water carried within the line. Park employee safety is also at risk whenever the pipe breaks due to the hazards resulting from working in open trenches.

An early step in the National Park Service planning process is to involve the public. Public comment was first sought in May 2001 through letters and a press release. Since the scope of the project has been amended to provide for rehabilitation of the line instead of replacement, we are again soliciting comments on the concerns and issues to be addressed in an environmental assessment (EA) that is being prepared for this project. The EA should be available for public review in the spring of 2002.

United States Department of the Interior

NATIONAL PARK SERVICE
Petrified Forest National Park
Arizona 86028

IN REPLY REFER TO L7617
x H4217

March 20, 2002

VIA CERTIFIED MAIL, RETURN RECEIPT

Mr. James W. Garrison
State Historic Preservation Officer
Arizona State Parks
1300 West Washington
Phoenix, AZ 85007

Re: Advance notification of the NPS intention to use the EA to meet its Section 106 obligations for waterline rehabilitation at Petrified Forest National Park

Dear Mr. Garrison:

The National Park Service at Petrified Forest National Park is proposing to rehabilitate 13 miles of waterline from the Puerco River to the Rainbow Forest developed area at the southern end of the park. The project also includes replacement of portions of the water distribution lines which serve the visitor center areas, including park concession, administrative and housing facilities. The project may also include the installation of fire suppression systems in certain buildings and structures at Rainbow Forest. Project objectives are to provide a reliable, safe source of water to the Rainbow Forest area and to other areas of the park, and to enhance the park's fire suppression capabilities to better protect lives and historic structures.

The Civilian Conservation Corps (CCC) constructed the section of water line under current project consideration during the late 1930s. The water line is potentially eligible for listing in the National Register of Historic Places as an historic structure, and a section of the line was previously evaluated as a structure contributing to the National Register eligibility of the Rainbow Forest Historic Designed Landscape. We have informally consulted with Ann Howard and Bill Collins of your office regarding the project and the line's National Register eligibility, and in the near future will be sending you documentation supporting the line's potential eligibility.

Numerous breaks have occurred in the cement-asbestos water pipe over the last several years, which have required extensive NPS park maintenance efforts to locate and repair. Water lost from line breaks represents a substantial cost to the park. Breaks also pose a risk to public health and safety due to possible exposure of the water supply to contaminants, and potential hazards to park maintenance employees handling asbestos pipe and working in open trenches.

In fulfillment of requirements of the National Environmental Policy Act, the NPS has initiated the preparation of an environmental assessment (EA) that will evaluate the potential impacts of project alternatives on natural and cultural resources, and other relevant topics. The process and documentation required for preparation of the EA will be used to comply with Section 106 of the National Historic Preservation Act. Cultural resource topics under present consideration in the EA include prehistoric archeological resources identified within the area of potential effect along

the pipeline corridor, the historic CCC pipeline, and historic buildings and landscape features at Rainbow Forest that may be affected by the placement of new distribution lines and fire suppression systems. In accordance with section 800.8(3)(c) of the Advisory Council on Historic Preservation's regulations (36 CFR 800), I am providing your office advance notification of the NPS intention to use the EA to meet its Section 106 obligations.

We welcome your input on the project and our intended efforts to avoid adverse effects on historic properties. We will provide you a copy of the EA when it is completed documenting anticipated project effects on cultural resources. Thank you for your assistance. Should have any questions, please contact me at (928) 524-6228 x225.

Sincerely,

Michele M. Hellickson
Superintendent

cc:
Jane Crisler, Advisory Council on Historic Preservation
Laurie Domler, NPS/IMRO
Richard Marshall, NPS/DSC
Steve Whissen, NPS/DSC

United States Department of the Interior
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 FAX: (602) 242-2513

In Reply Refer To:

AESO/SE
2-21-00-I-110

June 7, 2001

RECEIVED
JUN - 8 2001
PETRIFIED FOREST
NATIONAL PARK

Memorandum

To: Superintendent, Petrified Forest National Park, Arizona

From: Field Supervisor

Subject: Replacement of 13 Miles of Waterline from Puerco River to the Rainbow Forest

This memorandum responds to your May 16, 2001, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project area (Apache County). The attached list may include candidate species as well. We hope the attached county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-00-I-110.

The attached list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the attached lists are the Code of Federal Regulations (CFR) citation for each list and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please feel free to contact Tom Gatz.

Sincerely,

David L. Harlow

Attachment

cc: John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: APACHE

5/4/2001

1) LISTED

TOTAL= 12

NAME: NAVAJO SEDGE *CAREX SPECUICOLA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 50 CFR 19373, 5-8-85

DESCRIPTION: PERENNIAL FORB WITH TRIANGULAR STEMS, ELONGATED RHIZOMES. FLOWER: WHITE JUNE AND JULY

ELEVATION RANGE: 5700-6000 FT.

COUNTIES: COCONINO, NAVAJO, APACHE

HABITAT: SILTY SOILS AT SHADY SEEPS AND SPRINGS

DESIGNATED CRITICAL HABITAT IS ON THE NAVAJO NATION NEAR INSCRIPTION HOUSE RUINS. FOUND AT SEEP SPRINGS ON VERTICAL CLIFFS OF PINK-RED NAVAJO SANDSTONE.

NAME: ZUNI FLEABANE *ERIGERON RHIZOMATUS*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 50 FR 16682; 4/26/85

DESCRIPTION: HERBACEOUS PERENNIAL THAT GROWS IN CLUSTERS OF NUMEROUS ERECT UNBRANCHED STEMS UP TO 2.0 FEET (0.6 M) TALL. FLOWER HEADS SOLITARY; PALE BLUE RAY FLOWERS AND YELLOW DISK FLOWERS

ELEVATION RANGE: 7,300 TO 8,(FT.

COUNTIES: APACHE

HABITAT: SELINIUM-RICH RED OR GRAY DETRITAL CLAY SOILS DERIVED FROM THE CHINLE AND BACA FORMATIONS.

ONLY ONE ARIZONA LOCATION; OTHER 28 SITES IN SAWTOOTH MOUNTAINS AND NORTHWESTERNPART OF THE DATIL MOUNTAINS IN CATRON COUNTY, NEW MEXICO. TWO SITES ALSO ON THE NORTHWEST SIDE OF THE ZUNI MOUNTAINS IN MCKINLEY COUNTY, NEW MEXICO.

NAME: BLACK-FOOTED FERRET *MUSTELA NIGRIPES*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: WEASEL-LIKE, YELLOW BUFF COLORATION WITH BLACK FEET, TAIL TIP, AND EYE MASK. IT HAS A BLUNT LIGHT COLORED NOSE AND IS 15-18 INCHES LONG AND TAIL LENGTH IS 5-6 INCHES.

ELEVATION RANGE: <10,500 FT.

COUNTIES: COCONINO, APACHE, NAVAJO

HABITAT: GRASSLAND PLAINS GENERALLY FOUND IN ASSOCIATION WITH PRAIRIE DOGS

UNSURVEYED PRARIE DOG TOWNS MAY BE OCCUPIED BY FERRETS OR MAY BE APPROPRIATE FOR FUTURE REINTRODUCTION EFFORTS. THE SERVICE DEVELOPED GUIDELINES FOR SURVEYING PRAIRIE DOG TOWNS WHICH ARE AVAILABLE UPON REQUEST. NO POPULATIONS OF THIS SPECIES CURRENTLY KNOWN TO EXIST IN ARIZONA.

1

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **APACHE**

5/4/2001

NAME: **MEXICAN GRAY WOLF** *CANIS LUPUS BAILEYI*

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 43 FR 1912, 03-09-78

DESCRIPTION: LARGE DOG-LIKE CARNIVORE WITH VARYING COLOR, BUT USUALLY A SHADE OF GRAY. DISTINCT WHITE LIP LINE AROUND MOUTH. WEIGH 60-90 POUNDS.

ELEVATION RANGE: 4,000-12,00IFT.

COUNTIES: APACHE, COCHISE, GREENLEE, PIMA, SANTA CRUZ

HABITAT: CHAPPARAL, WOODLAND, AND FORESTED AREAS. MAY CROSS DESERT AREAS.

HISTORIC RANGE IS CONSIDERED TO BE LARGER THAN THE COUNTIES LISTED ABOVE. UNCONFIRMED REPORTS OF INDIVIDUALS IN THE SOUTHERN PART OF THE STATE (COCHISE, PIMA, SANTA CRUZ) CONTINUE TO BE RECEIVED. INDIVIDUALS MAY STILL PERSIST IN MEXICO. EXPERIMENTAL NONESSENTIAL POPULATION INTRODUCED IN THE BLUE PRIMITIVE AREA OF GREENLEE AND APACHE COUNTIES.

NAME: **APACHE (ARIZONA) TROUT** *ONCORHYNCHUS APACHE*

STATUS: THREATENED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 40 FR 29864, 07-19-1975

DESCRIPTION: THIS YELLOWISH OR YELLOW-OLIVE CUTTHROAT-LIKE TROUT HAS LARGE DARK SPOTS ON BODY, ITS DORSAL, ANAL, AND CAUDAL FINS EDGED WITH WHITE. IT HAS NO RED LATERAL BAND.

ELEVATION RANGE: >5000 FT.

COUNTIES: APACHE, GREENLEE, GILA, GRAHAM, NAVAJO

HABITAT: PRESENTLY RESTRICTED TO COLD MOUNTAIN STREAMS WITH MANY LOW GRADIENT MEADOW REACHES

OCCUPIES STREAM HABITATS WITH SUBSTRATES OF BOULDERS, ROCKS, AND GRAVEL WITH SOME SAND OR SILT THROUGH MIXED CONIFER AND SPRUCE-FIR FORESTS, AND MONTANE MEADOWS AND GRASSLANDS IN THE WHITE MOUNTAINS. ALSO MANAGED AS A SPORT FISH UNDER SPECIAL REGULATIONS.

NAME: **LITTLE COLORADO SPINEDACE** *LEPIDOMEDA VITTATA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 52 FR 35054

DESCRIPTION: SMALL (<4 INCHES LONG) SILVERY MINNOW WHICH IS DARKER ON THE BACK THAN THE BELLY

ELEVATION RANGE: 4000-8000 FT.

COUNTIES: COCONINO, APACHE, NAVAJO

HABITAT: MODERATE TO SMALL STREAMS IN POOLS AND RIFFLES WITH WATER FLOWING OVER GRAVEL AND SILT

CRITICAL HABITAT INCLUDES EIGHTEEN MILES OF EAST CLEAR CREEK, EIGHT MILES OF CHEVELON CREEK, AND FIVE MILES OF NUTRIOSO CREEK

2

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: **APACHE**

5/4/2001

NAME: **CALIFORNIA CONDOR** *GYMNOPS CALIFORNIANUS*

STATUS: EXPERIMENTAL/NONESSENTIAL CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001; 03-11-67

DESCRIPTION: VERY LARGE VULTURE (47 IN., WINGSPAN TO 9 1/2 FT, WEIGHT TO 22 LBS); ADULT PLUMAGE BLACKISH, IMMATURE MORE BROWNISH; ADULT WING LININGS WHITE, IMMATURE MOTTLED; HEAD & UPPER PARTS OF NECK BARE; YELLOW-ORANGE IN ADULTS, GRAYISH IN IMMATURE.

ELEVATION RANGE: VARIES FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE

HABITAT: HIGH DESERT CANYONLANDS AND PLATEAUS

LAST WILD CONDOR REPORTED IN ARIZONA IN 1924. RECOVERY PROGRAM HAS REINTRODUCED CONDORS TO NORTHERN ARIZONA, WITH THE FIRST RELEASE (6 BIRDS) IN DECEMBER 1996. RELEASE SITE LOCATED AT THE VERMILLION CLIFFS (COCONINO CO.). WITH AN EXPERIMENTAL/NONESSENTIAL AREA DESIGNATED FOR MOST OF NORTHERN ARIZONA AND SOUTHERN UTAH.

NAME: **MEXICAN SPOTTED OWL** *STRIX OCCIDENTALIS LUCIDA*

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91; 66 FR 8530, 2/1/01

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA, PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERED. CRITICAL HABITAT WAS REMOVED IN 1998 BUT RE-PROPOSED IN JULY 2000 AND FINALIZED IN FEB 2001 FOR APACHE, COCHISE, COCONINO, GRAHAM, MOHAVE, PIMA COUNTIES; ALSO IN NEW MEXICO, UTAH, AND COLORADO.

NAME: **SOUTHWESTERN WILLOW FLYCATCHER** *EMPIDONAX TRAILLII EXTIMUS*

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS, WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM, YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT ON PORTIONS OF THE 100-YEAR FLOODPLAIN ON SAN PEDRO AND VERDE RIVERS; WET BEAVER AND WEST CLEAR CREEKS, INCLUDING TAVASCI MARSH AND ISTER FLAT; THE COLORADO RIVER, THE LITTLE COLORADO RIVER, AND THE WEST, EAST, AND SOUTH FORKS OF THE LITTLE COLORADO RIVER, REFERENCE 60 CFR:62 FR 39129, 7/22/97.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY: APACHE

5/4/2001

3) CANDIDATE

TOTAL= 1

NAME: THREE FORKS SPRINGSNAIL *PYRGULOPSIS TRIVIALIS*

STATUS: CANDIDATE CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: MINUTE HYDROBIID SNAIL: SHELL OVATE- TO NARROWLY-CONIC; HEIGHT 1.5-4.5 MM; WHORLS, 2.5-5.0

ELEVATION RANGE: 8000-8500 FT.

COUNTIES: APACHE

HABITAT: RHEOCRENE SPRINGS, SEEPS, MARSHES, SPRING POOLS, OUTFLOWS AND DIVERSE LOTIC WATERS COMMONLY REFERRED TO AS CIENEGAS

DISTRIBUTION LIMITED TO THREE FORKS AND BONEYARD SPRING COMPLEXES IN THE NORTH FORK EAST FORK BLACK RIVER WATERSHED OF EAST-CENTRAL ARIZONA.

6

United States Department of the Interior

NATIONAL PARK SERVICE
Petrified Forest National Park
Arizona 86028

IN REPLY REFER TO:

H32
x L7617 (waterline)

VIA CERTIFIED MAIL, RETURN RECEIPT

April 22, 2002

James W. Garrison
State Historic Preservation Officer
Arizona State Parks
1300 West Washington
Phoenix, AZ 85007

Re: Determination of National Register Eligibility; Petrified Forest NP Waterline

Dear Mr. Garrison:

In previous correspondence, we have informed your office that Petrified Forest National Park is proposing to rehabilitate 13 miles of waterline from the Puerco River to the Rainbow Forest developed area at the southern end of the park. The project also includes replacement or improvements to the water distribution lines at Rainbow Forest and the Painted Desert headquarters area. The project may include the installation of fire suppression systems in selected buildings and structures at Rainbow Forest. Project objectives are to provide a reliable, safe source of water to the Rainbow Forest area and other areas of the park, and to enhance the park's fire suppression capabilities to better protect lives and historic structures.

Consideration of the potential historical significance of the main water transmission line from the Puerco River to Rainbow Forest has factored in the development of project alternatives. In further consultation with your office, and in accordance with 36 CFR 800.4(c)(1)&(2), we are submitting this recommendation of National Register of Historic Places eligibility for the main water transmission line to formally document the line's significance, and establish its character-defining features to assist the assessment of project effects.

Historical Background

The construction of the waterline under current project consideration is directly linked to the development of Rainbow Forest in the southern portion of then-designated Petrified Forest National Monument. In 1923, the National Park Service established headquarters at Rainbow Forest. Operations remained there until relocated to the new Painted Desert complex north of Interstate Highway 40 in 1962, the same year the monument received national park status. The initial assemblage of buildings constructed at Rainbow Forest (e.g. museum, ranger and custodian residences) were little more than temporary shacks. In 1928, Rainbow Forest's first stone building was built that housed a store and lunchroom; the building became the Rainbow Forest Lodge the following year. Major development occurred during 1931-1932 with construction of a new museum/administration building, employee residences, and large parking area in front of the museum. Further measures to accommodate the motoring public included improvements to the main monument road, and construction of a bridge over Jim Camp Wash (NPS, 2001).

Despite the development strides made during the early 1930s, adequate supporting infrastructure (particularly utilities) had not kept pace. However, under the auspices of New Deal conservation program funding, the monument became the beneficiary of much-needed federal assistance to complete improvements. In 1934, the monument received funding and the commitment of an available labor force supplied by the Civilian Conservation Corps (CCC) to carry out a variety of projects. Among the CCC undertakings completed at headquarters were landscaping, and the construction of sidewalks, additional employee residences, and other structures.

From the outset, NPS managers faced the difficulty of securing an adequate water supply to meet the increased development and visitation demands at Rainbow Forest. Although a well was drilled there in 1932 (deepened in 1934), it provided water high in salt content that was unsuitable for all but sanitary facility use. Potable drinking water continued to be hauled to the area. In 1934, a well was drilled close to the Puerco River to provide water for the nearby CCC camp; (the camp was relocated to Rainbow Forest in November, 1934). Use of the well to supply water for Rainbow Forest, approximately 13 miles to the south, was recommended in a December, 1934 list of proposed public works projects for the monument. However, approval to begin the project was not obtained until 1938 following an initial appropriation of $36,000. The services of the CCC were retained to carry out the construction (NPS, 1941).

In November, 1938, the final location survey for the waterline from the Puerco River pumping station to Rainbow Forest was completed by assistant engineer, Willard L. Bradley, of the NPS engineering division in Santa Fe, New Mexico. The machinery of the Puerco River pumping station was housed in a skillfully-built cut stone pump house with log vigas reflecting a rustic southwestern style. The structure's use as a pump house was later discontinued and it is now used for storage. Trench excavation also began in November, 1938, under the supervision of CCC foreman, P.H. Finn, who oversaw an initial crew of 40 CCC laborers. Around the same time, excavation began for a 50,000-gallon concrete storage reservoir on the mesa above Rainbow Forest. The reservoir was completed in 1939 under the direction of a Public Works Administration (PWA) foreman assisted by 3 laborers (NPS, 1941). This reservoir was subsequently abandoned, replaced by a larger 200,000 gallon buried concrete reservoir constructed nearby in the late 1960s.

Between 10 to 145 CCC laborers worked on the waterline at various times over the course of the project. Most of the trenching work consisted of hand-digging with pick and shovel to an approximate minimum depth of 3 ½ ft. Heavy equipment, including bulldozer and power shovel, were occasionally used to excavate where removal of deep sand dunes was required; excavation to a depth of 13 ½ ft. was necessary in one such area north of Dry Creek Wash. In most places, the trenching was through hard clay and shale. Approximately 10,000 linear feet of rock excavation was carried out between the pumping station and the reservoir, and blasting and jackhammering were required where solid rock was encountered. The pipe used for most of the waterline was 21/2-inch and 3-inch "Transite" pipe, a asbestos-cement material produced by the Johns-Manville Company. A company representative periodically made on-site inspections to ensure the pipe laying and fittings were properly installed. Although trenching began in November, 1938, the delivery and stockpiling of pipe occurred in March, 1939, and the actual

laying of pipe did not begin until May. This resulted in some sections having to be dug out a second time where excavated material had eroded back into the trench over the intervening months (NPS, 1941).

In October, 1939, the waterline was extended directly up the steep face of the first mesa encountered south of the Puerco River pumping station. This section, described by project engineer Willard Bradley as "the most difficult part of the pipe line construction," required great care to ensure that line breaks or leaks did not occur. Special "Tee-Tite" expansion rings were used in the fittings, and 5-ft. pipe lengths were used on the sharp vertical curves. Upon completion of this section, rubble masonry retaining walls were constructed across the trench to help hold the backfill in place and control erosion. These walls are still in place. Efforts were evidently taken to ensure that the backfilled trench blended into the hillside to minimize visible scarring of the natural landscape (NPS, 1941).

Completion of the waterline to the Rainbow Forest reservoir was successfully accomplished in February, 1940. In April, a final difficult section of 4-inch line was completed from the reservoir down the steep mesa slope to the headquarters area. This required excavation through 300 linear feet of solid rock by means of drilling and blasting. Rubble retaining walls were constructed across the backfilled trench along the face of the slope. Following completion of the line in April, 1940, the reservoir was filled to a sufficient level to permit a final test of the pipe mainlines at headquarters. No significant leaks were detected, and assistant engineer Bradley remarked that "I feel that this is a good record, as there are so many tees, valves, ells, fire-plugs and other fittings placed in this area." June 30, 1940 was recorded as the contract completion date for the waterline project, with construction costs totaling $119,600 (NPS, 1941).

In May, 1997, the park discontinued obtaining water from the Puerco River pumping station, and converted to the purchase of water from the Navajo Tribal Utility Authority (NTUA). The NTUA draws water from wells located several miles east of the park, chlorinates the water, and pumps it to the park's 500,000 gallon reservoir by Chinde Point near the Painted Desert headquarters community. The water is then delivered by gravity approximately 20 miles to Rainbow Forest, initially transported south from the Painted Desert area by a waterline that was originally constructed in the 1960s, significant portions of which were replaced in the early 1990s; this line connects with the original waterline at its former point of origin by the Puerco River. Puerco Well No. 2, developed in 1959, remains a backup water supply for the park. Puerco Well No. 1 has essentially been abandoned.

National Register Eligibility

The approximately 13 mile-long section of Petrified Forest NP waterline constructed 1938 to 1940 from the Puerco River to Rainbow Forest appears to meet the criteria for eligibility to the National Register of Historic Places as an historic structure. Although some portions of the transmission line's pipe have been replaced with modern materials over the course of routine maintenance activities and valves, couplings, and other mechanical appurtenances associated with the functioning line have also been replaced as needed, the line overall retains very good historical integrity reflecting the original design intent, location, setting, and physical

characteristics. The waterline's eligibility is best addressed by National Register criterion A pertaining to its association with events that have made a significant contribution to the broad patterns of our history. Construction of the line represents a major engineering accomplishment across difficult desert terrain and conditions, and reflects the great lengths that the NPS was willing to pursue in the 1930s to secure a reliable water source to support the growing development at the Rainbow Forest headquarters area. The project was carefully designed and executed to minimize the possibility of leaks or other structural failures. Although a number of leaks have occurred over the last several years (13 leaks between July, 1996 and December, 1997) to prompt the current rehabilitation project, the waterline has provided overall reliable service for over 60 years. A 1986 engineering evaluation projected that the line was likely to retain an additional 50 years of usable life.

The association of the waterline with the Civilian Conservation Corps is another important aspect of its significance. During the hardships of the Great Depression, the CCC provided a readily available labor force for public works projects, and accomplished the daunting feat of hand-digging the majority of trench and laying pipe. By some estimations, the waterline is among the longest (if not the longest) of any utility line constructed by the CCC in the National Park System. It could be argued that without the availability of CCC labor, construction of the waterline and the overall park development that it supported would have been significantly delayed, perhaps not occurring until after World War II.

Perhaps to a lesser extent, the waterline also meets National Register criterion C for its ability to embody the characteristics of a type, period, and method of construction. Although by its nature mostly hidden from view, the waterline is representative of the pipeline technology commonly available throughout the country during the 1930s. Despite the health risks recognized today from air-borne asbestos, the asbestos-cement "Transite" pipe used for the waterline has proven a durable material particularly suited to desert soil chemistry and other environmental factors. Extant ancillary structures such as the cut stone pump house near the Puerco River, stacked rock retaining walls on the steep mesa slopes, and the now-abandoned 50,000 gallon reservoir at Rainbow Forest, further contribute to the waterline's significance under Criterion C.

The terminus of the CCC-constructed water distribution system at Rainbow Forest has been identified as a structure contributing to the significance of the Rainbow Forest Historic Designed Landscape (NPS, 2001). The present evaluation of National Register eligibility for the overall CCC waterline from the Puerco River to Rainbow Forest supports the earlier finding of significance for the line in its capacity as a contributing designed landscape element, and further recommends consideration of the line as a National Register-eligible structure in its own right.

Sources

Collins, William S.
1999 The New Deal in Arizona. Arizona State Parks Board, Phoenix, Arizona.

National Park Service

1941 "Final Construction Report, Petrified Forest National Monument, 12 Miles 2 ½ inch Pipe, Tank, Pump and Pumphouse; Account O.P. 752-05-187," by Willard L. Bradley, assistant engineer, and James B. Hamilton, associate engineer. NPS, Division of Engineering, Santa Fe, New Mexico.

2001 "National Register of Historic Places Registration Form; Rainbow Forest Historic Designed Landscape, Petrified Forest National Park," by Jill Cowley, historical landscape architect, and Lisa Nicholas, historical landscape architect intern. NPS (IMSF-CNR), Santa Fe, New Mexico.

Please advise us if you concur with the National Register eligibility of the waterline. We will continue to consult with your office regarding the project to rehabilitate the line. Thank you for your assistance. Should you have any questions, please contact me at (928) 524-6228 x225.

Sincerely,

Michele M. Hellickson
Superintendent

cc:
Laurie Domler, NPS/IMRO
Jill Cowley, NPS/IMSF-CNR
Richard Marshall, NPS/DSC
Steve Whissen, NPS/DSC

"Managing and conserving natural, cultural, and recreational resources"

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General Fax:
602.542.4180

Director's Office Fax:
602.542.4188

SHPO-2001-1351 (10753)
not eligible

May 10, 2002

Michele M. Hellickson
Superintendent
United States Department of the Interior
National Park Service
Petrified Forest National Park, AZ 86028

re: Waterline/Eligibility/NPS

Dear Ms. Hellickson,

I am in receipt of your letter of April 22, 2002 (L7617); and offer the following comment:

The eligibility of the waterline is an issue of its contributing significance to the historic district. Its situation, i.e. buried underground, poses serious questions of any sign or signature conveyed that contributes realistically to the character of the district. If it were the case, that the district's principle buildings and structures were located in reaction to its path, then perhaps a case might be made in recognition of the pipeline's influence as integral to the district's design. I suspect, however, that the line's course was subject instead to the situation of the buildings and structures.

Certain retaining walls and buildings signal the waterline's course and protect the pipe and associated mechanical devices located above ground. As in a sympathetic riparian growth tracing a formative presence in testament to the course of a submerged and otherwise invisible stream, these would be the only waterline features possibly contributing to the district.

This office is not prepared to concur that the waterline is individually eligible or qualifies as a contributing feature of the district. Moreover, its alteration has little potential to effect the district's historical integrity.

Sincerely,

Robert R. Frankeberger

Robert R. Frankeberger, AIA
Architect, State Historic Preservation Office

RECEIVED
MAY 20 2002
PETRIFIED FOREST
NATIONAL PARK

"L7617: Waterline"

THE HOPI TRIBE

Wayne Taylor, Jr.
CHAIRMAN

Phillip R. Quochytewa, Sr.
VICE-CHAIRMAN

May 21, 2001

Michele M. Hellickson, Superintendent
Attention: Water Line Project
Petrified Forest National Park
P.O. Box 2217
Petrified Forest, Arizona 86028

Dear Micki,

Thank you for your letter dated May 16, 2001, regarding a proposed project involving the potential replacement of a 13 mile waterline between the Puerco River and Rainbow Forest, with an additional 12 miles of distribution lines which serve Park facilities. As you know, the Hopi Tribe claims cultural affiliation to the *Hisatsinom*, People of Long Ago, including the prehistoric cultural groups in Petrified Forest National Park. Therefore we appreciate your continuing solicitation of our input and your efforts to address our concerns.

The Hopi Cultural Preservation Office understands that an Environmental Assessment is being prepared for this proposal. To assist us in identifying if this proposal may affect cultural resources significant to the Hopi Tribe, please provide us with cultural resources surveys of the areas of potential effect.

As you also know from our letter dated February 7, 2001, regarding revision of the 1992 *General Management Plan*, and preparation of a new *Wilderness Management Plan*, we are interested in assisting Petrified Forest National Park and the National Park Service in refining issues important to the Hopi Tribe to be addressed by the *General Management Plan* revision and the *Wilderness Management Plan*. Unfortunately, the Hopi Cultural Preservation Office was unable to send a representative in response to your letter dated March 7, 2001, to the April 17 workshop.

Therefore, the Hopi Cultural Preservation Office reiterates our invitation to the appropriate Petrified Forest and National Park Service regional staff and you to make a presentation on these two new planning initiatives at our June, 2001, administrative meetings. Please contact the Hopi Cultural Preservation Office to set up an appointment, and thank you again for your consideration.

Respectfully,

Leigh J. Kuwanwisiwma, Director
Cultural Preservation Office

xc: Suzy Stutzman, MSC IMDE-PE, NPS, P.O. Box 25287, Denver, CO 80225-9811

P.O. BOX 123 — KYKOTSMOVI, AZ. — 86039 — (520) 734-3000

L 7617 - waterline

UNITED STATES GOVERNMENT
OFFICE OF NAVAJO AND HOPI INDIAN RELOCATION

March 30, 2001

Christopher J. Bavasi
Executive Director

Ms. Michele M. Hellickson
Superintendent
National Park Service
Petrified Forest National Park, AZ 86028

Dear Ms. Hellickson,

Earlier this week I was meeting with Mr. Cecil Nez, the Chapter President for the Nahat'a' Dziil Chapter on some other issues and he gave me a copy of the letter that was sent to him from your office regarding the proposed project to expand and improve the water distribution system in the Petrified Forest National Park (PFNP). I thought that I would use this opportunity to both introduce myself and provide comments on the proposed water line project.

I have served as a Federal Land Use Manager for the Office of Navajo and Hopi Indian Relocation (ONHIR) for several years throughout the development of the area to the east of the PFNP known as the "New Lands". We share a common boundary north of Interstate Forty. In the past this agency has installed woven wire fencing on that boundary line. Further, there are some potential issues of mutual interest that we may wish to discuss in the future including the proposed development of a travel center at the Interstate Forty/Pinta Road Site.

In regards to the water line project, I have the following two comments:

1. In your letter to Mr. Nez you mentioned that the water line had been evaluated in 1986 and that it was determined at that time to have a 50 year life expectancy. In the mid 1990's the PFNP was tied into the New Lands water system. Is it possible that the new system provided greatly increased water pressure to your existing lines resulting in numerous breaks? This was our experience when we first tied the new system into the existing system in Navajo, Arizona. We were able to reduce the number of line breaks and the staff time spent fixing them by installing a pressure reduction valve. This is only a temporary fix, but has greatly reduced the problem until a new line can be installed.

2. The ONHIR is interested to know if you anticipate any significant changes in water utilization as a result of your proposed improvement project.

I look forward to your response and look forward to meeting with you in person some time in the near future.

Sincerely,

Tim Varner

Tim Varner
Land Use Manager

cc: Cecil Nez, President, Nahat'a' Dziil Chapter
Chris Bavasi
Chron
Desk

P.O. Box KK · 201 E. Birch · Flagstaff, Arizona 86002 · (520) 779-2721 · Fax (520) 774-1977

APPENDIX 3

SAMPLE PLAN DRAWINGS

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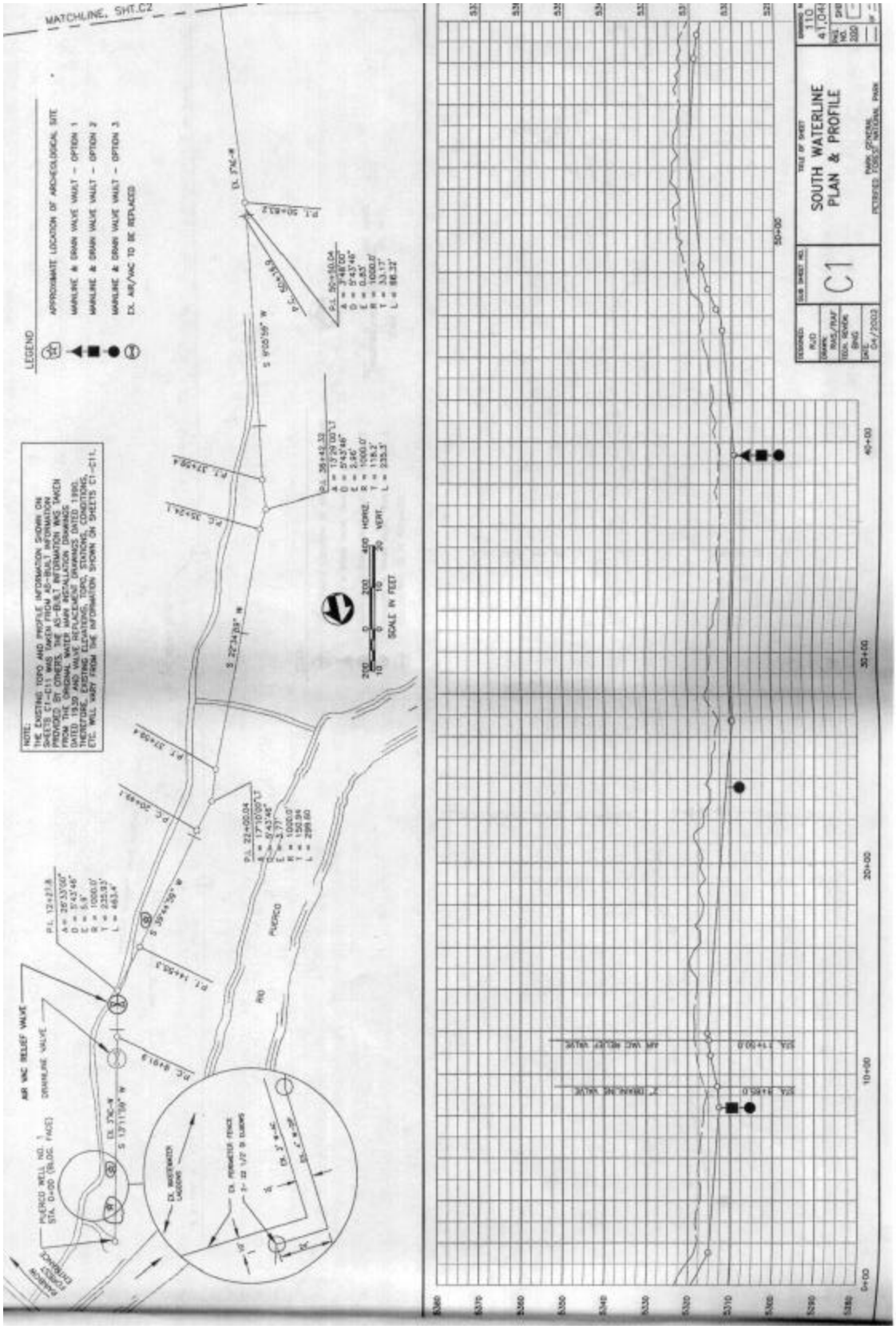
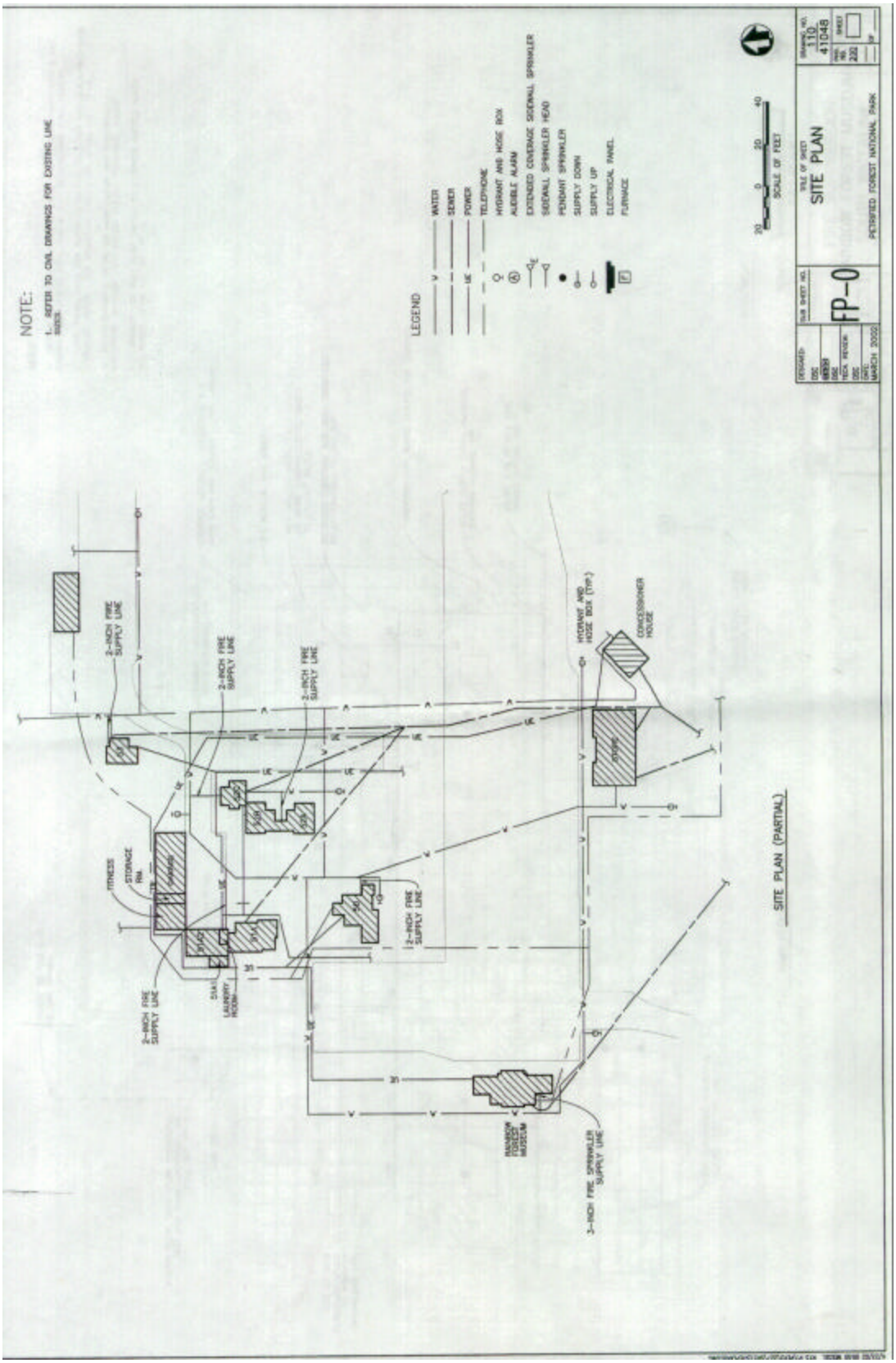
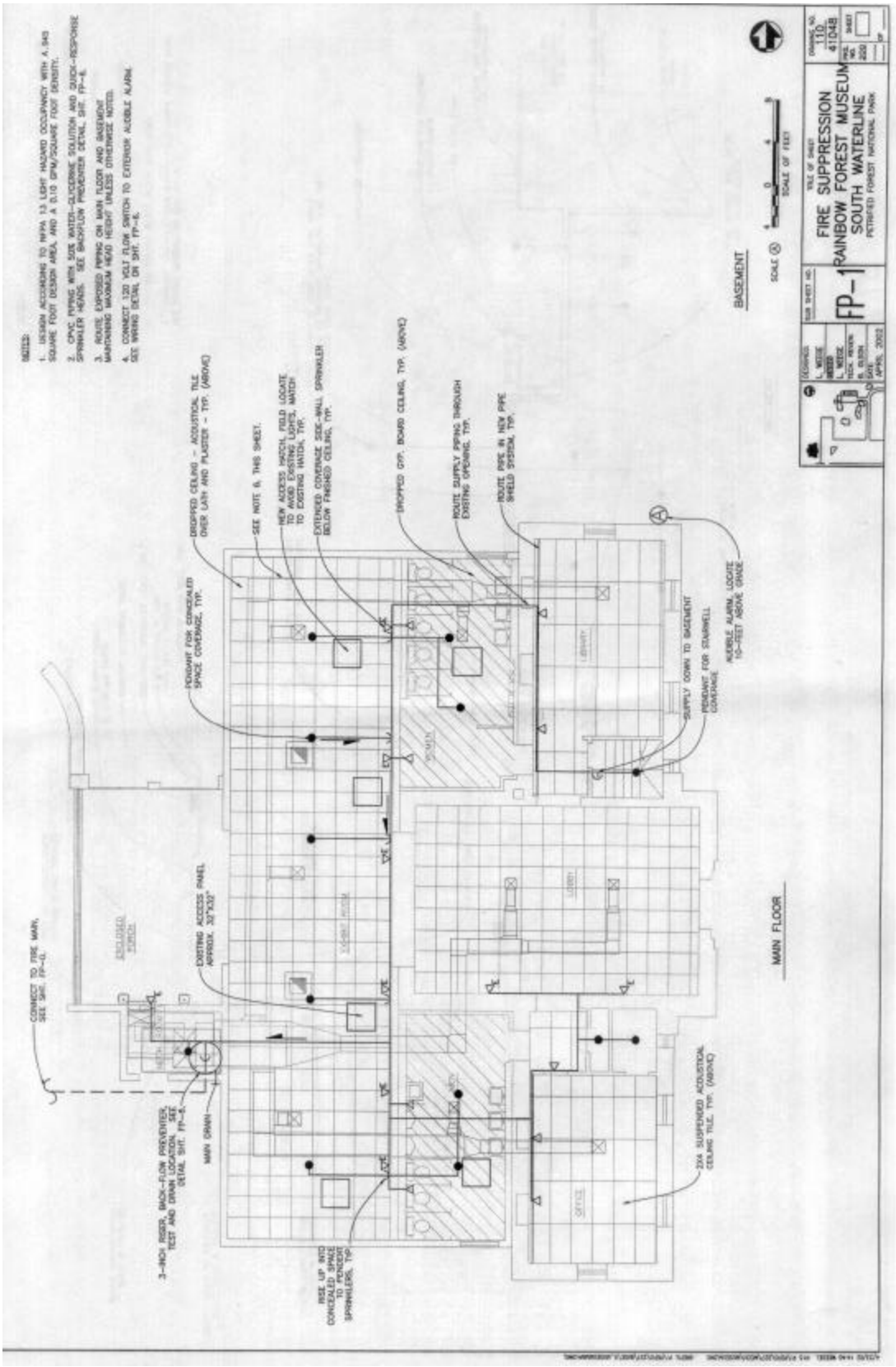


EXAMPLE OF SOUTH WATERLINE REPAIR



PROPOSED WATERLINE PLAN FOR RAINBOW FOREST DEVELOPED AREA



PROPOSED FIRE SUPPRESSION SYSTEM FOR RAINBOW FOREST MUSEUM

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APPENDIX 4

BIRD SPECIES KNOWN TO OCCUR ALONG THE EXISTING PIPELINE

The following table lists birds known to occur along the existing pipeline. It also describes their status in the park and indicates their distribution along the pipeline.

Common Name	Scientific Name	Status in the Park	Distribution Along Existing Pipeline[1]
Audubon's warbler	*Dendroica coronata*	Uncommon migrant (spring or fall)	Puerco sewage lagoons (3)
Brewer's sparrow	*Spizella breweri*	Rare year-round resident	Puerco sewage lagoons (1)
Canyon towhee	*Pipilo fuscus*	Rare year-round resident	Puerco sewage lagoons (1)
Chipping sparrow	*Spizella passerina*	Uncommon migrant (spring or fall)	Near Rainbow Forest water tank (3)
Dark-eyed junco	*Junco hyemalis*	Common winter resident	Puerco sewage lagoons (2)
Green-tailed towhee	*Pipilo chlorurus*	Uncommon migrant (spring or fall)	Near Rainbow Forest water tank (1)
Horned lark	*Eremophila alpestris*	Common year-round resident	Throughout (38)
House finch	*Carpodacus mexicanus*	Common summer resident (breeding)	Puerco sewage lagoons (6)
Killdeer	*Charadrius vociferous*	Uncommon summer resident (breeding)	Puerco sewage lagoons (1)
Loggerhead shrike	*Lanius ludovicianus*	Common year-round resident	Closer to Puerco sewage lagoons (2)
Northern flicker	*Colaptes auratus*	Uncommon summer resident (breeding)	Puerco sewage lagoons (2)
Red-napped sapsucker	*Sphyrapicus nuchalis*	Rare (resident status unknown)	Puerco sewage lagoons (1)
Rock wren	*Salpinctes obsoletus*	Common year-round resident	Throughout (11)
Ruby-crowned kinglet	*Regulus calendula*	Uncommon migrant (spring or fall)	Puerco sewage lagoons and near Rainbow Forest area (2)
Rufous-crowned sparrow	*Aimophila ruficeps*	Rare (resident status unknown)	Puerco sewage lagoons (4)
Say's phoebe	*Sayornis saya*	Common summer resident (breeding)	Puerco sewage lagoons (1)
Vesper sparrow	*Pooecetes gramineus*	Uncommon migrant (spring or fall)	Near Rainbow Forest water tank (2)
White-crowned sparrow	*Zonotrichia leucophrys*	Common winter resident	Puerco sewage lagoons (11)
Yellow warbler	*Dendroica petechia*	Uncommon migrant (spring or fall)	Puerco sewage lagoons (1)

NOTE: [1]Distribution determined from surveys conducted for Nowak and Hart 2001; number in parentheses indicates total number of individuals live-trapped and released during both surveys (September and October 2001)

SOURCE: Nowak and Hart 2001

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